PTEMBER, 1951 Vol. 40, No. 7

STATE NORMAL COLLEGE
YPSILANTI, MICH.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

SCHOOL OPENING NUMBER

Safely through the fog

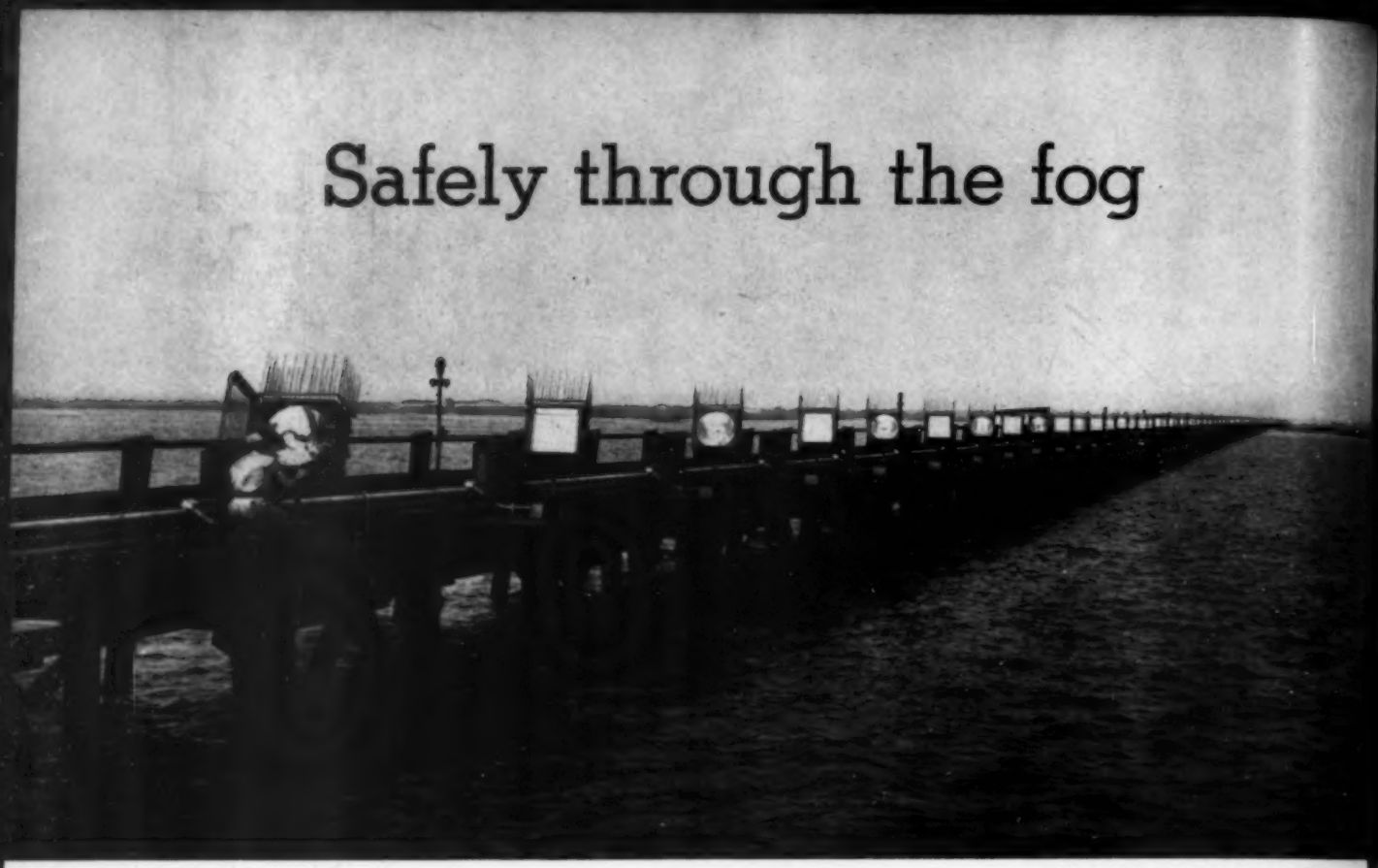

Photo credit The Port of New York Authority
All Weather Landing Lights, N. Y. Airport

There are times when the fog descends but airplanes must keep on flying and strive to come safely home. And now science has found a way to cut through the heaviest fog, to signal the pilot so he can set his precious cargo down in safety. Using the gas Krypton in glass bulbs the size of a cigaret, these new signal lights develop a brilliance of more than 3 billion candle power, outshining the sun and setting up a standard that is seen through thickest murk.

Fog descends but men must keep on living, keep on going, must strive to bring the precious cargo of their lives safely home through the curving span of their years. Has the Krypton light that pierces the fog been developed in their case? Some say it is integrity of purpose, magnificence of effort, staunch opposition to the downward flow of things, which opposition may be life, may be spirit, may be the supreme creator. And the educator on whom the responsibility falls, must make sure these standards are clearly seen by the lads in his classroom, by possessing such standards himself, by unobtrusively living them and showing them at all times. Education is nothing if it is not the fore-shadow of coming events, reflecting in the classroom what will be encountered *beyond* the classroom. The educator's integrity will bring into mechanical drawing for example, something of the attitude of engineers and scientists who labor for the benefit of their fellow men. And the educator's consistency will say that if the work is important, then its tools are important, and will exert utmost care in selecting these tools, respecting the evident care and craftsmanship used in their design. To *fail* to be consistent *here* would be the last intolerable cynicism.

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There is no substitute for good equipment of the right type in any school shop. Follow the lead of the best schools in the country and specify South Bend. Then you will know that you are getting the most for your money.

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South Bend 7" Bench Shaper

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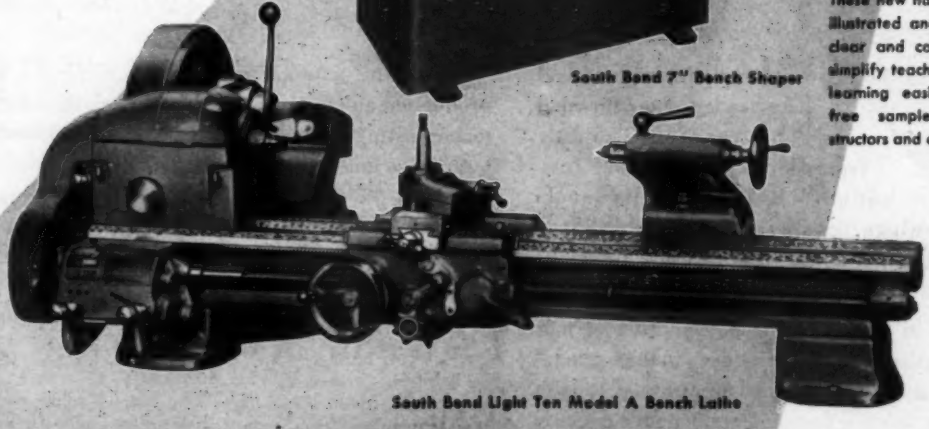
"How To Run A Drill Press"

"How To Run A Metalworking Shaper"

These new handbooks, fully illustrated and written in a clear and concise manner, simplify teaching and make learning easier. Send for free samples (shop instructors and directors only).



South Bend Light Ten Model A Bench Lathe

SEND INFORMATION CHECKED:

☐ _____

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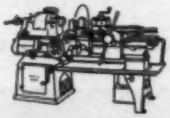
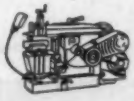
☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES



☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



☐ 7" BENCH SHAPERS

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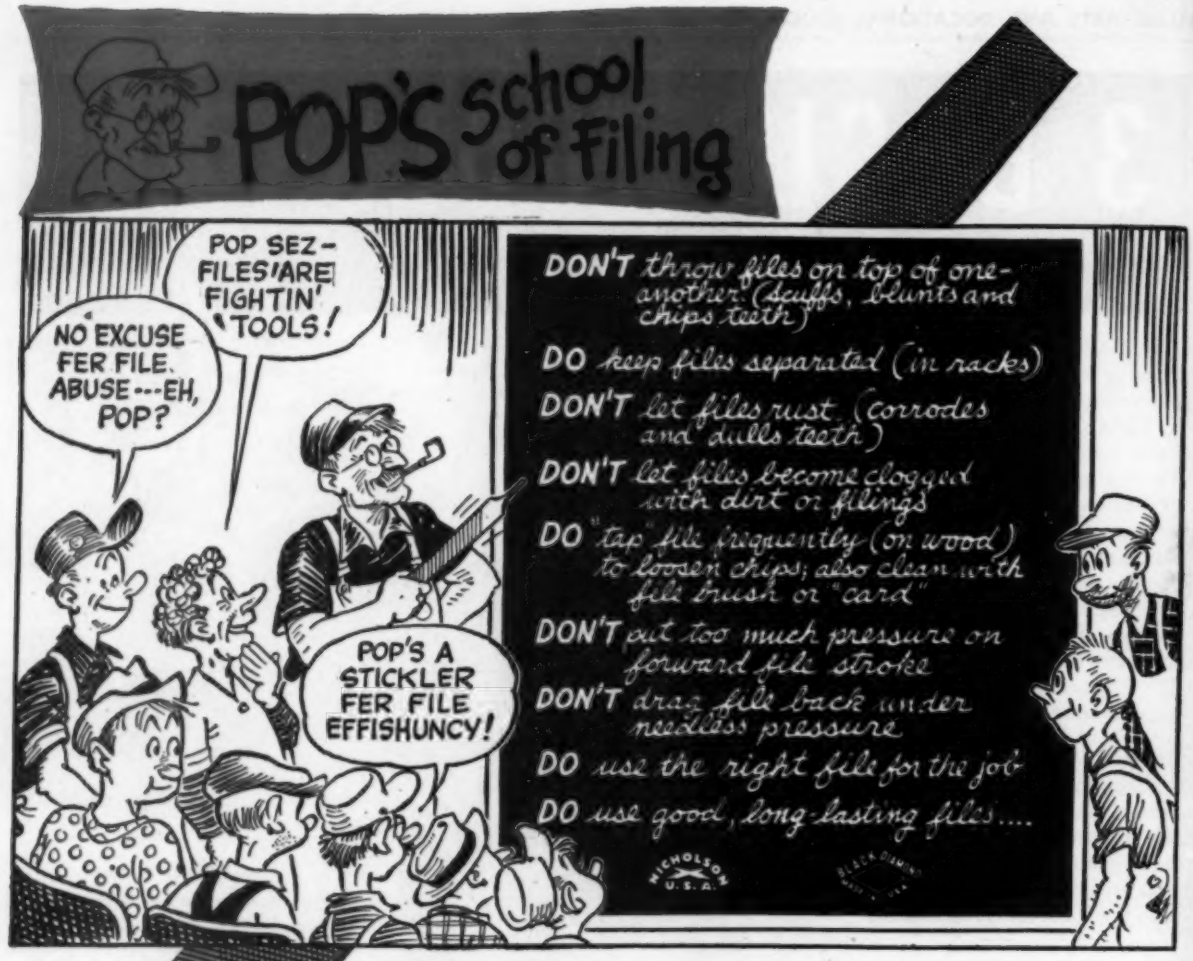
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DO "tap" file frequently (on wood) to loosen chips; also clean with file brush or "card"
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DON'T drag file back under needless pressure
DO use the right file for the job
DO use good, long-lasting files....
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Many a foresighted and long-headed shop foreman of Pop's type is often unjustly regarded as "just an old fuss-button." But in establishments where files are an important item in the tool budget, abuses and misuses like those indicated above can run production costs ragged.

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HOW TO SELECT, USE AND CARE FOR FILES is helpfully expounded in Nicholson's famous 48-page illustrated book, ***"File Filosophy."*** Sent free to training school heads and instructors on individual requests.

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Vol. 40 No. 7

SEPTEMBER, 1951

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

Published on the 15th of month preceding date of issue

THE BRUCE PUBLISHING COMPANY,
400 North Broadway, Milwaukee 1, Wis.
• CENTRAL OFFICE: 20 North Wacker Drive, Chicago 6, Ill. • EASTERN OFFICE: 225 Broadway, New York 7, N. Y.

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This Month's Cover

The cover for the September issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows a method of utilizing waste space for the storage of tools, devised by Norbert Young, instructor at the Maine Central Institute, Pittsfield, Me.

The student shown is Robert Hackett.

The photograph was submitted by Edward R. Stanley, director of publicity of the Maine Central Institute.

The School Year 1951–52

We feel sure that the majority of our readers are glad that the regular school year is about to start again.

May the year 1951–52 come up to all of their expectations. In the meantime best wishes and good luck to all.

★ ★ ★ ★

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1951, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price in the United States, Canada, and countries of the Pan-American Union, $3.00 per year, payable in advance. Postage, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for upon publication. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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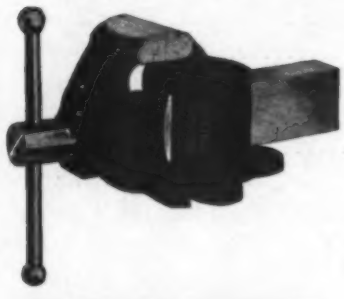

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ASSOCIATION NEWS

COMING CONVENTIONS

Sept. 21–22. Ohio Vocational Association, at Southern Hotel, Columbus, Ohio. Secretary: Ralph C. Woodin, 4 Rehersal Hall, Ohio State University, Columbus, Ohio.

Oct. 8–11. Future Farmers of America, at Municipal Auditorium, Kansas City, Mo. Secretary: A. W. Tenney, Office of Education, Federal Security Agency, Washington, D. C.

Oct. 8–12. National Safety Council, at Stevens Hotel, Chicago, Ill. Secretary: R. L. Forney, 425 N. Michigan Ave., Chicago, Ill.

Oct. 18. Utah Vocational Association, at Salt Lake City. Secretary: Reed R. Allen, Box 177, Provo, Utah.

Oct. 19–20. Puerto Rico Vocational Association, at Arecibo Vocational School, Arecibo, P.R. Secretary: Miss Gladys E. Munoz, c/o Ponce High School, Ponce, P.R.

Oct. 25. Indiana Vocational Association, at Arsenal Tech. Stuart Hall, Indianapolis, Ind. Secretary: Glen Barkes, 802 E. Market St., New Albany, Ind.

Oct. 26. New Mexico Vocational Association, at Albuquerque, N. Mex. Secretary: L. C. Dalton, state supervisor of agricultural education, Box 98, State College, N. Mex.

Oct. 26–27. Four-State Industrial Arts and Vocational Education Conference, at Kansas State Teachers College, Pittsburg, Kans. Secretary: J. V. Melton, Kansas State Teachers College, Pittsburg, Kans.

THE WASHINGTON INDUSTRIAL ARTS ASSOCIATION

The first state-wide meeting of the industrial-arts teachers of the state of Washington was held on the campus of the Central Washington College of Education at Ellensburg, Wash., on April 7, 1951. The purpose of this meeting was to organize and form the Washington Industrial Arts Association.

The objectives of the new association are to foster, develop, and evaluate industrial arts as a part of general education and to stimulate interest on the part of teachers, school administrators, and laymen in the constructive development of industrial-arts education in the state of Washington.

Following an expressed desire on the part of the industrial-arts teachers of the state for such an organization, the initial planning steps were taken by the teacher training institutions of the state. It was decided that due to the peculiar terrain of the state and to eliminate, in so far as possible, long drives for the teachers, the state should be divided into six regional areas. Each area was to organize and carry on an active program during the year within its region and the entire program to be culminated with a state-wide meeting in the spring. The officers of the various areas are: Eastern Washington: Arthur Beaudreau, chairman; W. J. Dunlop, secretary-treasurer; Central Washington: Alba Shriner, chairman; J. Gordon Bauman, vice-chairman; Reinholt Haring, secretary-treasurer; Northwest Washington: C. S. Jones, chairman; Francis Hublow, secretary-treasurer; King County, Kitsap County, and Peninsula: Robert O. Flumerfelt, chairman; Dury A. Fox, secretary-treasurer; West Central Area: Lawrence Pinson, chairman; Robert I. Johnson, secretary-treasurer; Southwest Washington: Delmar C. Laupp, chairman; Jefferson C. Jeffers, secretary-treasurer.

The organizational meeting was held at 10 a.m. in the College auditorium at which time a constitution was adopted and the following officers

(Continued on page 6A)

Washington State industrial-arts group, Ellensburg, Wash.

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ASSOCIATION NEWS

(Continued from page 4A)

were elected: Dury Fox, supervisor of industrial arts, Renton, Washington, *president;* W. J. Dunlop, industrial-arts teacher at Lewis and Clark High School, Spokane, *vice-president;* Dale Buckley, assistant supervisor of industrial arts, Seattle, *secretary-treasurer.*

At the convention luncheon Dr. Verne Fryklund, who was introduced by U. Glenn Whiffen, presented the group with several good organizational principles and techniques.

Dr. Fryklund was also the main speaker at the afternoon session. At this time he told of his recent experiences in Japan.

An outstanding feature of the meeting was a group of displays including tools, equipment, and shop projects, etc., arranged by J. Gordon Bauman, industrial-arts instructor at Cle Elum, Wash.

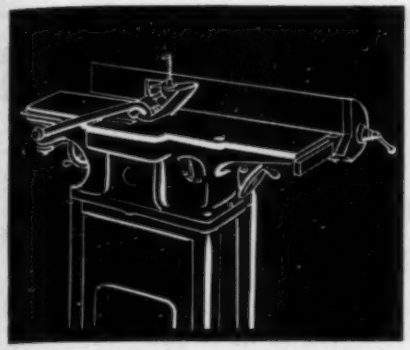
AMERICAN INDUSTRIAL ARTS ASSOCIATION

Newly elected officers of the A.I.A.A. are: president, Dr. Gordon O. Wilber, director, division of industrial arts, State University of New York, State Teachers College, Oswego, N. Y.;

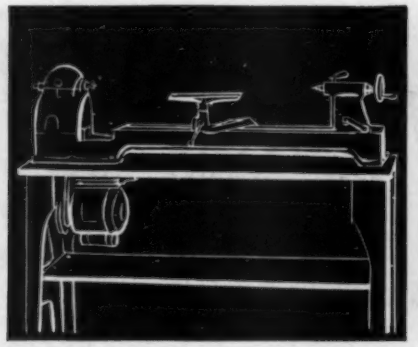
(Continued on page 28A)

At the end of one of the American Industrial Arts Association sessions in New York, May, 1951

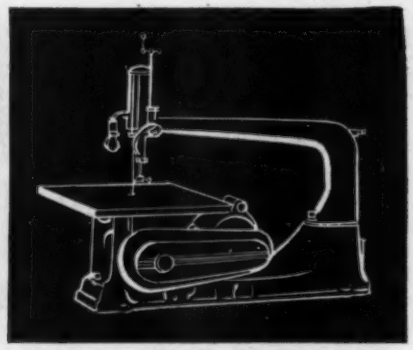
Reading from left to right: John R. Ludington, U. S. Office of Education, Washington, D. C.; Edgar Fuller, executive secretary, National Council of Chief School Officers, Washington, D. C.; DeWitt Hunt, president of A.I.A.A.; and John R. Hurley, chairman of local arrangements committee



6" Jointer For handling narrow strips, planing thin stock, surfacing, and beveling, as well as jointing. Its versatility alone makes this machine a good investment. Dual Purpose Guard speeds planing, protects operator.



Four Speed Lathe Built chiefly for wood turning, cast iron head stock and double row pre-loaded spindle bearings make it an ideal machine for metal spinning. Give your students the advantage of Walker-Turner design!



24" Jig Saw Four operating speeds, easily and quickly adjusted blade tension. Designed to meet the needs of industrial arts and vocational schools. Cuts wood, paper, fibre, plastics, bone, all kinds of sheet metal.

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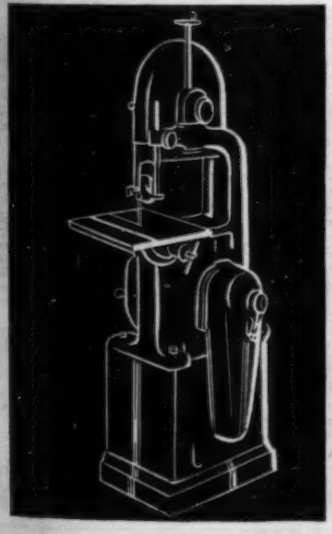
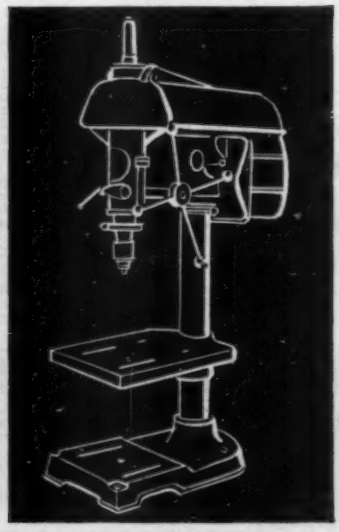
16" Band Saw Safety first — and built to last! These are features, too — as important to schools as the speed, accuracy and operating ease of Walker-Turner's new 16" Band Saw. For wood and metal-cutting



15" Drill Press Use it for drilling, sanding, mortising, grinding, spot polishing metal surfaces (of machines), removing rust and scale, or shaping ornaments — this versatile power tool is a school shop in itself!



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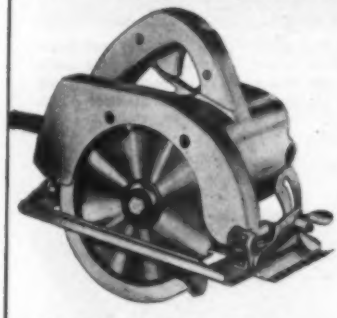
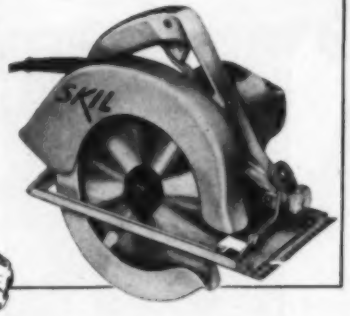


Model 520—5⅜" blade with maximum cutting capacity of 1⅞" in wood. Base adjustments: vertical depth of cut ¾" to 1⅞"; tilts for bevel cuts; 1⅜" depth of cut at 45°. No-load speed: 5800 r.p.m. Overall length: 10⅛". Weight: 10½ pounds.

Model 565—8¼" blade with maximum cutting capacity of 2⅜" in wood. Base adjustments: vertical depth of cut 1/16" to 2⅜"; tilts for bevel cuts; 2⅛" depth of cut at 45°. No-Load speed: 5000 r.p.m. Overall length: 12½". Weight: 13½ lbs.



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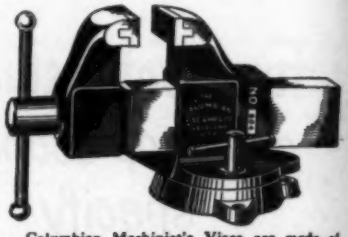

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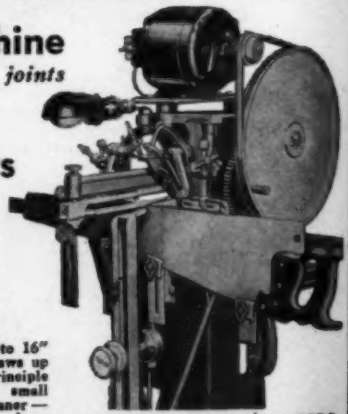
HAND, BAND, CIRCULAR Saws



The Foley Saw Filer is ideal for sharpening saws used by students in school shops. It keeps them in tip-top shape, faster and better than by hand filing. Used by Army, Navy, hundreds of manual training departments and industrial plants. The Foley is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, crosscut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer. Foley filed saws have less breakage and last longer.

*** 30-DAY TRIAL OFFER**

You may have the privilege of using the Foley Saw Filer in your own shop for 30 days. Write or send coupon for details and list of school users.

TYPICAL SCHOOL USERS

Berea College, Berea, Ky.; Board of Education, Cleveland, Ohio; Boys Technical H. S., Milwaukee, Wis.; Charleroi School District, Charleroi, Pa.; Redlands Public Schools, Redlands, Calif.; Stout Institute, Menomonie, Wis.

FOLEY Automatic SAW FILER

FOLEY MFG. CO., 3318 N.E. 5th St., Minneapolis 18, Minn.
Please send full information on 30-Day Trial Offer and list of school users of Foley Saw Filers.

Name.....

Address.....

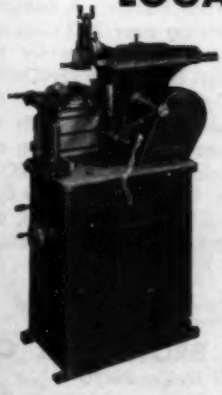
School.....

LOGAN "955" 11″ LATHE

The 955 equips the metal working teacher to train the student in every type of lathe operation. With 1″ collet capacity, 1⅜″ spindle hole, 11″ swing and center distances of 24″ or 36″, this lathe handles sizeable work *accurately*. Less than .0005″ spindle runout 12″ from the bearing; and a two-V-way, two-flat-way bed precision ground to within .0005″ maximum variation are typical of the tolerances to which it is built. The 45 to 1500 rpm speed range of the ball bearing mounted spindle permits all operations from roughing to high speed carbide tool cutting. Completely enclosed headstock, countershaft and motor means maximum safety for the student. The 955 is ruggedly built for hard school shop use. Its trim, compact steel cabinet is ideal for multiple installations. No other lathe of comparable specifications is comparable in low initial cost. Write now for full information.

LOGAN ENGINEERING CO.
4901 West Lawrence Avenue, Chicago 30, Illinois

LOGAN 8″ SHAPER



brings to the school shop the capacity, precision and versatility that make it a widely used industrial tool. Powerful 8½″ stroke. Six automatic feeds in either direction, from .002″ to .012″. Designed for safety.

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Work Better

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JR. LINE of
SAWS

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Students and instructors alike—and all who admire fine tools—respect the complete line of Atkins Jr. *"Silver Steel"* saws. And they should, for here are precision-built, accurate cutting saws exactly like their larger counterparts in everything but size. Smaller, yes, but crafted in the Atkins tradition of best quality and value. Especially rugged for classroom use, these saws of famous family uphold *"Silver Steel"* quality and performance to the Nth degree. Ditto for Atkins' popular Mechanic-Cut Circular saw!

"Use, don't abuse, fine tools"!

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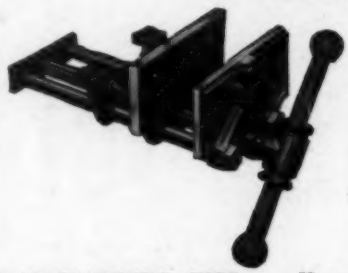
A COMPLETE LINE OF VISES



accuracy
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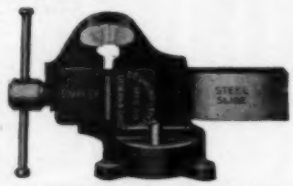

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PARKS No. 20 20" PLANER

Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for every shop and industrial plant requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds — 20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.

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A compact, sturdy, thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive catalog sheet.

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Kalamazoo BAND SAW

A veritable workhorse in any school shop! Prepares bars, angles, tubes, pipe, and rounds for work on other machines with no burr, minimum kerf. Works fast, smooth, and accurately. Familiarizes students with industrial metal cutting techniques. Uses standard ⅓ HP 110/60/1 motor. Completely portable. Write for details.

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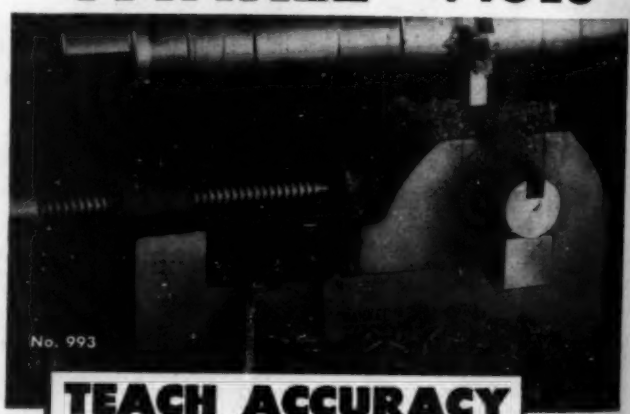

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Start-to-finish work holding encourages precision . . .

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Drills for the hobbyist, student or mechanic are available in sizes ranging from .0069" to 3½" diameter.

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Wood Bit with ¼" shank. Will fit Electric Drill with ¼" chuck.
Power Auger Bit. For use in Electric Drills with ¼" chuck. For Wood.
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Carbide Tipped. For drilling hardened steel.
Carbide Tipped. For drilling Concrete, Cement, Brick, Slate, Marble, Stone, etc.
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Straight Shank Drill. For General Purpose Drilling.
Straight or Taper Shank. For General Purpose Drilling.

The majority of the drills illustrated are obtainable in sets and packaged in convenient and attractive containers. Write for catalog or descriptive circulars.

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Train students RIGHT *on one of these "Oliver" Surfacers . . .*

"Oliver No. 299 smoothly planes stock up to 24" wide, 8" thick

This "Oliver" Surfacer feeds at any rate from 18 to 40 feet a minute by the turn of a dial. Its one-piece base casting assures permanent alignment of working parts. Revolving parts fully enclosed to exclude dirt and provide maximum safety. Built-in knife jointer and grinder always ready for use. Adjustments made from outside of machine. Write today for Bulletin No. 299.

"Oliver No. 399 is a whiz at planing stock up to 18" wide, 6" thick

Has one-piece base casting assuring lasting alignment of parts, Heavy roller bearing cylinder has three high-speed knives. Heavy table runs on friction-less roller bearings. Power driven feed rolls handle 15 to 35 feet a minute. Takes stock up to 18" wide, 6" thick, short as 8½" when fed singly. Built to give years of top service. For full details, write for Bulletin No. 399.

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Band Saws	Jointers	Lathes	Sanders
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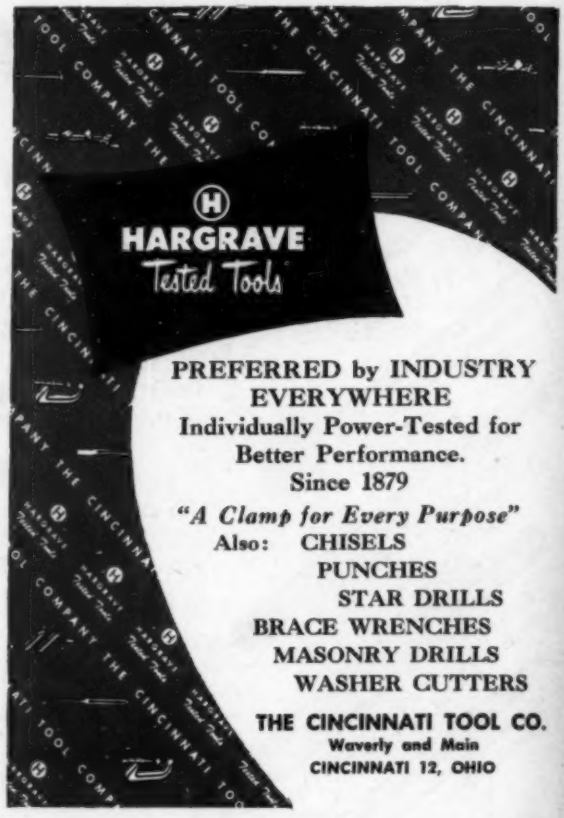
OLIVER

OLIVER MACHINERY COMPANY

Established 1890 Grand Rapids 2, Mich.



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Individually Power-Tested for Better Performance.
Since 1879

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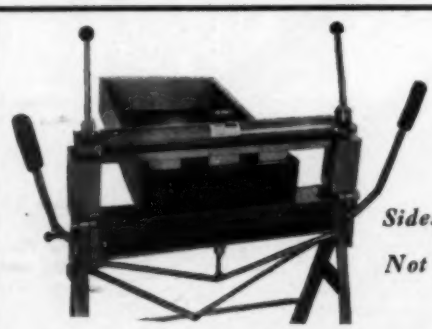

Sides are formed to box
Not box to sides

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Makes the only box brake that is open which allows sheet to remain flat thru-out operation. Makes the only slip end brake on which ducts and other similar products can be locked and removed from machine.

IN TWO SIZES — 30 INCH AND 48 INCH

WEBB MACHINE & TOOL CO.

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TRAY-TOP CINTILATHES

GET STRAIGHT "A's"

in school shops — because . . .

They're ADAPTABLE

to a wide range of operations on hard or soft steels, cast irons, non-ferrous metals, with high speed or carbide tools. 12 speeds, all geared, in geometrical progression, 40 to 1 overall ratio. 48 thread and feed changes. Top speeds to 1800 rpm.

EFFICIENT

Simple, direct motor drive, minimum gear contacts; shaved gears; spindles mounted in large anti-friction bearings, effective lubrication throughout.

CONVENIENT

Centralized controls; instant selection of speeds with unique direct-reading "color-match" dial; dual control levers, easy-to-read thread chasing dial; graduated tailstock barrel; "Tray-Tops" for convenient parking of tools, etc.

DURABLE

Anti-friction and oilite bearings, amply lubricated; integrally splined shafts and spindle of hardened alloy steel; Flamatic hardened gears in headstock, apron, and quick-change gear box; ground bedways, hardened if you specify.

SPACE SAVING

With two cabinet legs and "Tray-Tops" for parking tools, the ordinary storage cabinet becomes unnecessary.

SAFE

Control levers and snap levers disengage if something accidentally falls on them; long taper key drive spindle (chucks and face plates cannot spin off); electrical equipment fully enclosed; "Tray-Tops" keep wrenches, tools, gages off carriage wings and ways; cabinet legs store chucks and face plates away from operator's feet.

AND LOW IN COST

Tray-Tops are truly economical. For example, the 15" x 42" Toolroom Model, with taper attachment, flame hardened ways, two chucks, and regular equipment including 2 hp motor sells for only $3,684.00, f.o.b. Cincinnati.

OF OUTSTANDING VALUE

For straight "A's", school shops must have training equipment as modern and efficient as that in industry. Tray-Top Cintilathes not only have the features that serve 85% of most light duty lathe requirements: they help students learn the most about lathe work on the same equipment they will meet in industry after graduation. Best of all, Tray-Tops are priced within the reach of even modest school budgets. Make Tray-Top your next buy because it's your best buy.

CINCINNATI LATHE & TOOL CO.

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NEW! POWERFUL! Motor Driven!

Model 106

ONLY 49.50

PORTER-CABLE Guild Orbital Sander

IDEAL FOR FURNITURE, BUILT-INS, INLAY WORK
Leaves no fur—provides dead-smooth, professional-looking surfaces without a blemish.

LEVELS GLUED, BUTT, MITER JOINTS
Can't be surpassed for blending spots where opposing grains or different woods meet.

CHAMFERS EDGES; SANDS ROUNDED SURFACES
Ideal for sash, screens, doors. Smooths plywood without chipping.

EASY TO USE IN VERTICAL POSITIONS
Lightweight, well-balanced. Sands in corners, recesses, close to moulding, difficult places

DESIGNED *for flawless finishing.* Sands with, against, across the grain—without marring! Abrasive pad travels at high speed in ¼-inch orbits. Can't track . . . no tendency to dig or burn . . . won't *gouge* or *ripple*. A fine piano finish every time—10 times faster than hand sanding!

BUILT *for student use.* Powerful Universal AC-DC motor—*not* a vibrator. No skill required. No adjustments to make. Patented paper clamp—holds abrasive flat and tight, takes ½ of 9" x 11" sheet. Trouble-free gearless drive. Dust-free air intake avoids sawdust congestion. Weighs only 6 lbs.

PRICED *for school budgets.* Mass produced to high precision standards—a combination that provides quality at rock-bottom prices. $49.50 is all the Guild 106 costs you . . . and worth every cent in *finer* finishing—*longer* service—less upkeep. Your Guild dealer will demonstrate. Or mail coupon for details.

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Excell in Simplicity and Ease of Operation.

- Our "SPIN MASTER" lathes are preferred by industry because they are rugged, precise and simple. No complicated speed changes to get out of order.
- For teaching and for industry you cannot go wrong with a

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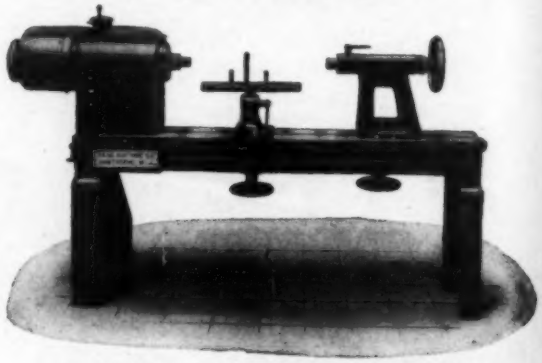

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Metal Spinning Accessories and Equipment.
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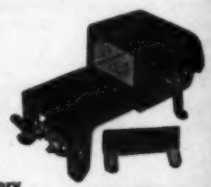
EASY FAST

TEACH HEAT TREATING

The Modern Way with Quick Acting JOHNSON Furnaces

No. 101 Bench Furnace



Delivers up to 1800° F. without a blower. Powerful, efficient and economical. For heating soldering coppers up to 12 lbs. per pair. Ideal for heat treating, case hardening, and annealing carbon steels. Two burners. Firebox 3¾ x 4½ x 5½. Complete with work rest block and baffle plate.

$17.50 F.O.B. Factory

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Use this furnace for heat treating carbon steels and for melting soft metals such as lead, tin, zinc, babbitt, etc. Lid on hood may be removed and 22 lb. melting pot inserted. Firebox 6¼ x 5 x 6½. Complete with pot as illustrated.

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The flexible shop

SHOPSMITH introduces a new concept in industrial arts education

SHOPSMITH

SHOPSMITH as Circular Saw

SHOPSMITH as Disc Sander

SHOPSMITH as Wood Lathe

SHOPSMITH as Drill Press

SHOPSMITH as Horizontal Drill

The FLEXIBLE SHOP is a new idea—a revolutionary concept of shop instruction inspired by a revolutionary power tool, SHOPSMITH. It assures more effective utilization of shop facilities—in large schools as well as small. It provides equipment tailored to the needs of each class. Here, briefly, is the idea behind the FLEXIBLE SHOP:

- School shop requirements vary from day to day and from class to class. With a FLEXIBLE SHOP, a school can meet the requirements posed by the progress and projects of any group of students.
- Each SHOPSMITH can be set up as a standard lathe, saw, sander, vertical drill press, horizontal drill or jigsaw.
- Congestion and delay are eliminated. Students and machines need never stand idle, because idle machines can always be changed to the tool position most in demand at any time.
- With the SHOPSMITHS set up alike, *more* students can be given instruction in the correct and safe use of any of the tools at one time.
- The FLEXIBLE SHOP means more shop in less space at lower cost. Students learn faster—acquire broader experience. The shop operates at 100% efficiency.

The basic, five-tool SHOPSMITH costs $189.50; with special ½-hp. motor and special school guards, $232.45. Write for research by educators on FLEXIBLE SHOP layouts and effect on teaching techniques.

SHOPSMITH SPECIFICATIONS

8″ CIRCULAR SAW — 2¼″ depth of cut. 17″ x 54″ effective table area.

12″ DISC SANDER — 14½″ x 17″ tilting table. Disc can be fed into work.

33″ WOOD LATHE—15″ swing over ways. Speeds from 800 to 3600 rpm.

15″ DRILL PRESS—Chuck to table, 27″ max.; to floor, 55″ max.

HORIZONTAL DRILL—Unlimited capacity, 4″ quill feed.

MAGNA ENGINEERING CORP., Dept. 179-U, *at factory nearest you*
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Please send me complete information about the FLEXIBLE SHOP and the application of SHOPSMITH to industrial arts education.

Name _____ Position _____
School _____
Address _____
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THE *IMPROVED* BUSS NO. 208

unquestionably the best machine for teaching standard wood planing practice

CAP. 20 x 8

Judge for yourself. It is the only planer in the low-cost field that is adjusted and operated similarly to the large standard machines used in industry . . . the only planer in this class that is equipped with a sectional infeed roll, sectional chipbreaker and four driven rolls — permitting the planing of pieces of varying thickness without the danger of kick-back. It's also the only small planer with in-built knife grinder and other big planer features. The grinder permits the instructor to grind the knives and joint them in just a few minutes. This saves much of his time and tends to eliminate the dull knife condition which so frequently prevents the student from doing good work. The frame is now a heavy one-piece semi-steel casting for great rigidity and strength. All driving mechanism and electrical wiring is fully enclosed, engineered for maximum safety. Judged from any angle the No. 208 is the best possible selection for the school shop and the price is well within the means of the average school budget. Write for the complete facts.

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MACHINE WORKS
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SKILLS DEVELOP FASTER with the tools of today — Snap-on Tools

The precise degree of tightness specified by factory engineers is applied instantly with a rugged Snap-on Torqometer, to cylinder head studs of a Buick engine.

• Training of mind, eye, and hands to meet the ever-higher standards called for today can be made needlessly slower and more difficult, if your classes are handicapped by old-fashioned or ill-assorted tools. Snap-on Tools, made expressly for professional mechanics, are preferred and chosen throughout industry. They are designed to bring out a student's natural skills—make him quicker, surer, more adept. They fit. They stand up. They stimulate carefulness and pride. There are more than 4,000 Snap-on hand and bench tools described or pictured in the big, new Snap-on Catalog. Sent only to instructors and school officials.

SNAP-ON TOOLS CORPORATION
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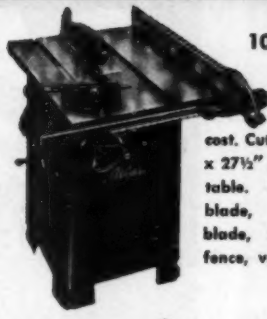
AN ALL-Atlas SHOP PAYS BIG STUDENT DIVIDENDS!

12" BAND SAWS

The ideal size for school shops. 14" x 14" precision-ground table tilts 45°. Cuts stock to 6¼" thick. Ball bearing equipped.



10" SAWS

The ultimate in fine saw construction at low cost. Cuts 3¼" deep. 35" x 27½" precision-ground table. 19½" right of blade, 13" ahead of blade, quick-positioning fence, vernier control.

15" DRILL PRESS

Finest made for shops. Bench and floor models. 4 ball-bearings, steel to steel drive, wider head support bearings, new depth control stop, smoother operation.

6" JOINTERS

The last word in jointer design. 42" long precision-ground table. 32" x 4½" fence supported close to cutter head. Stationary rear table for lasting accuracy.

24" JIG SAWS

The finest on the market. 14" x 14" precision-ground table tilts right and left swivels 90°. Four speeds for wood, metal, plastic, composition. Cuts 2¼" thick. Chucks index 90°.

Here's Why...

1. Atlas tools are compactly built — give you *more pupil stations* per given shop area.

2. Atlas tools are ruggedly built — take rough student use year after year.

3. Atlas tools are *easy to operate*. Students master woodworking fundamentals quicker, make faster progress.

4. Atlas tools have many exclusive features to save time on projects so that more can be accomplished each term.

5. Atlas tools are priced low. They give you *more tools and stations* for *your equipment appropriation.*

See for yourself why more and more industrial educators are standardizing on Atlas tools. Send the coupon below for free wall charts and latest catalog.

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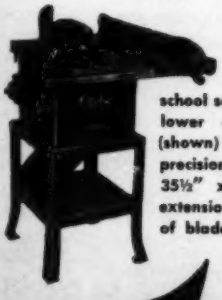
Sands any width boards, angles, curves, metals, plastics for complete sanding instruction. 10" disc, 4" belt, table tilts 45°.

SPINDLE SHAPERS

15" x 21" precision-ground table. Table adjusts vertically, stationary spindle for smoother cutting.



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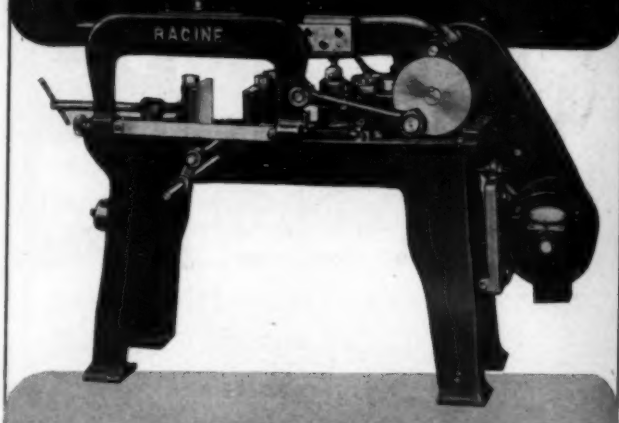

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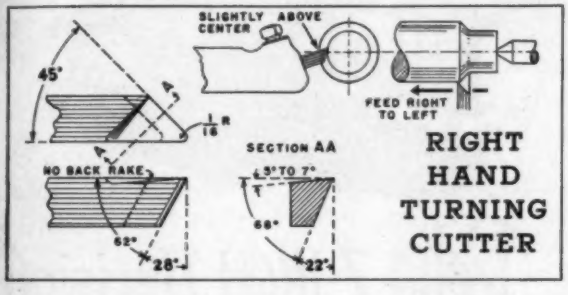
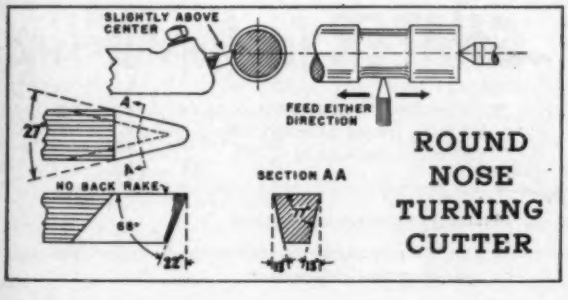
Memo to mechanics

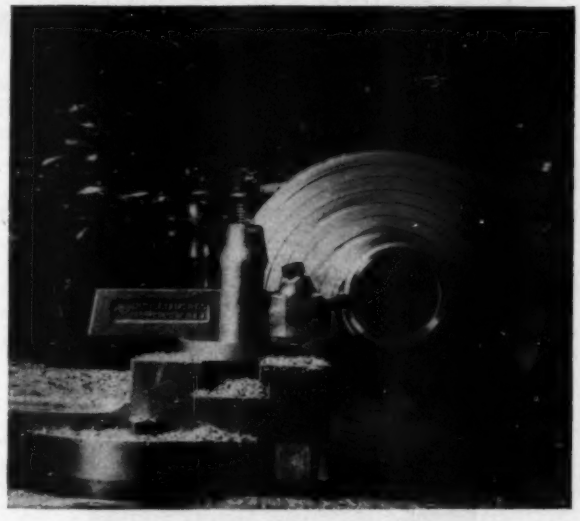
How to do it right with WILLIAMS TURNING TOOLS

The prime requisites of efficient metal turning are a properly ground tool, well supported, rigidly held, and correctly applied to the work. The following hints on the use of Williams Turning Tool Holders represent our recommended practice for general machine work. The two diagrams below illustrate application of cutting tool to the work and proper grinding angles for machining cast iron and steel with high speed steel cutters. If, after grinding, cutting edges are honed with an oil stone to remove burrs the bits will cut better and last longer.



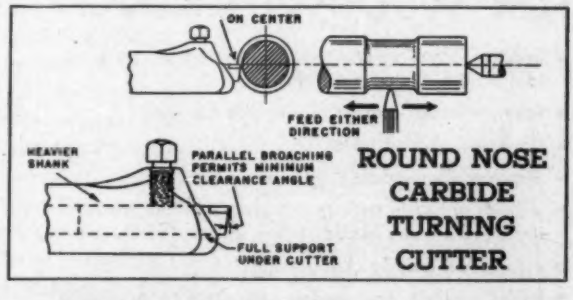


For turning brass and bronze, a round nose cutter... similar to the one illustrated above... is usually used. Brass cutting tools should be set at exact center of work... not above... and should be ground with a 15° negative back rake so that the top of the cutter will be flat when inserted in the Tool Holder (which has the cutter channel broached at 15°).



Carbide Turning Tool Holders

Since Tungsten Carbide Cutters are extremely brittle, it is essential that the cutter bit be held very rigid and the cutting edge supported as much as possible. Williams offer a Carbide Holder of heavier and longer design than the Regular Tool Holders of equal cutter capacity previously described. The cutter channel is broached parallel with the base of the shank rather than at the usual 15° angle. The parallel broaching of the cutter slot permits proper grinding of the cutter so as to give maximum support to the cutting edge. Williams Carbide Cutter Bits are ground ready for general use.



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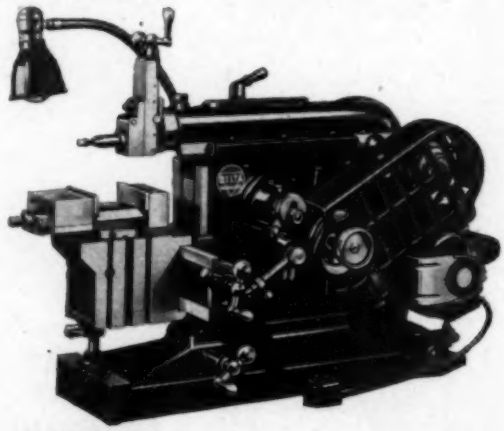

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

SEPTEMBER • • • • 1951

Leadership in Industrial-Arts Education

GORDON O. WILBER
Director, State Teachers College
Oswego, N. Y.

Since its inception, as manual training during the last quarter of the nineteenth century, industrial arts has been fortunate in having had many strong leaders. Runkel, Woodward, Bennett, Bonser, and many others have helped to develop and extend the influence of practical education within the public schools. If the movement which they started is to reach its full potentialities, however, there must be a continuing succession of leaders who will show the way to progress. It might be well, therefore, to look at the problem of leadership in industrial arts — what it is, how it is developed, and what the average teacher can do about it.

Members of a graduate class were recently asked to list what they considered the ten most outstanding leaders in industrial arts today, excluding anyone who might be connected with their own school. Just take a moment to consider. Could you, offhand, name ten outstanding leaders in our profession today, and what is more important could you justify your choice of those you might designate? The results from this class were decidedly disturbing. Out of the class of about sixteen, two or three finally came up with ten names. Most of the class had six or seven. Many of those named had long since passed to their reward, and others represented authors of texts which had appeared somewhere in the curriculum.

Who Are Our Leaders?

Some may be wondering why this should be told, for it certainly reflects no credit on the college or the teacher. However, it is doubtful that the result was much different from what one would find in any similar group in almost any college. Members of the class were asked how they accounted for their seeming lack of information concerning the leaders in their profession. One student said, "I guess we don't know who's playing on our team." Another student remarked that the answer could perhaps be found in the fact that they had not been doing as much, and as critical reading as might have been expected of them. Discriminating reading is certainly one method for becoming vicariously acquainted with the leaders in one's profession. A third student suggested that it might be possible that something was lacking in terms of outstanding leadership in industrial arts. Perhaps, he had hit the nail on the head in that statement. Perhaps something is wrong with our leadership. We have, it is true, a few nationally known leaders, who have been doing outstanding service for the profession, but one can count them almost on the fingers of one hand. In a profession such as ours we should have many more working for the advancement and growth of industrial arts — at the national level, at the state level, and in our local groups. What then is the reason for this dearth of leadership? Where are our Bonsers, our Bennetts, and our Russells? The fact is that the fault lies very much in ourselves. Many young teachers in the profession have demonstrated that they have the intellect, the ambition, and the skill to command positions of leadership, but as one looks over the alumni roll of teacher training institutions, he is frequently stunned by the fact that so few of these young men who gave such brilliant promise have actually lived up to their seeming ability. Why should this be so?

The answer is not a simple one. There are probably many reasons contributing to our seeming lack of leadership. Perhaps one of the more important is the fact that leadership requires more work, sacrifice, and self-denial than the average person is willing to give. Leadership does not come easily — it is not something that is served up to one without effort. Leadership is something that must be earned, and it is easy to see why many may decide that the rewards are not worth the price to be paid. In order that we may have, perhaps, a better idea of just what this price is, may we look at some of the criteria for leadership. These criteria appear to hold good for our own and probably for most other professions.

Requirements of Leadership

What then is required if one desires to be a leader in industrial arts? First of all one must have a sound philosophy covering the field of his interest. It is written in the *Good Book*, "If the blind lead the blind, both shall fall into the ditch." Without a clear vision of what is required for progress

in the profession one may not hope to lead toward a more general acceptance of our program. The question might well be asked, "But how does one get this philosophy? How can a young man be sure that what he believes is true?" And again the answer is not simple. No one can give anyone else a philosophy. A philosophy is something that must live and grow within you. Taking courses in philosophy will help in so far as they may show you how to attack the problem of working out and organizing your ideas. Aside from that it is up to you to decide what you believe about industrial arts, and why you believe it. However, the pattern will go something like this: You will start thinking about the problems and issues of industrial arts. Soon you will find that you must justify industrial arts as a part of our whole educational system, and so you will need to analyze and organize your thoughts concerning education in general. Then, you will begin to try to understand the place and function of education as it relates to life and existence. And so you will find it necessary to develop a satisfying philosophy of life. Hence, when one says that, to be a leader, one must have a clear-cut philosophy, it really means much more than merely knowing the objectives of one's own particular field. Reading and study will help — contacts with other leaders is also effective, for it is from such sources that one gets the ideas that must be accepted or rejected in building up one's own frame of reference. But, basically, the problem is one that each individual must work out for himself. Any person who is a leader in the true sense of the word not only has such a philosophy, but actually lives by it.

Secondly, a leader must be progressive in his thoughts and actions. He need not be radical. However, he must be looking forward rather than backward. A leader must be able to see better ways of doing things, and be willing to give up old ideas and old techniques, and to work toward the adoption of the new. To be a true leader one must, to a certain extent, be dissatisfied with the *status quo*.

If one accepts this thesis, however, it immediately places him in a delicate position. One finds if he looks about him, that most people are more than mildly fond of the *status quo*. The teacher who has worked long and hard on a course of study accepts with difficulty any idea which would make necessary a change, and the teacher who has laboriously written and polished a set of project sheets tends to use them over and over. Therefore, the leaders while recognizing the need for change and progress must also realize that changes are brought about slowly, especially when vested interests are at stake. He must keep clearly in mind, however, that continued defense of the *status quo*, no matter how desirable it may seem, can only lead to regression, and that no matter how good or effective a practice may seem there is always room for improvement.

Another attribute of a leader which appears to be of paramount importance is the ability to meet people graciously. Regardless of how brilliant a mind, or how much ability a person may have, unless he can impress the people that he meets, he is not likely to carry them with him. Most of our outstanding leaders have been men who appear to like people — collectively and individually, and have been able to impress others in such a way that they were themselves liked. This ability is something that can be learned and cultivated. It appears to stem largely from a conviction that others are sincere in their beliefs, and that each has something to offer to a common cause. The leader who can meet men of all stations, low as well as high in a way that inspires confidence and mutual friendliness is in a far better position to achieve his ends, than one who must overcome an initial feeling of distrust or antipathy.

Leadership Requires Courage, Willingness to Work and Sacrifice

Above all a leader must be willing to work and sacrifice for his cause. Leadership requires action, and action means work. Leadership requires that one be where leaders function. This means attending conferences and conventions, which in turn means the spending of money. Young men have frequently said, "How can one expect to be a leader, and still have any home life?" That is indeed a problem which everyone who aspires to leadership must face. As one's contacts become wider, and his leadership assumes more of a national scope, the problem of the sacrifice demanded from one's family become increasingly more difficult. A man who aspires to such leadership needs a wife who shares his aspirations and can find satisfaction in sharing with him his service to his profession and the success which can attend it. A recognition of this necessity for work and sacrifice — sacrifice which frequently affects home life, finance, and recreation is probably the greatest single factor in limiting the number of our potential leaders who actually achieve positions of recognition. Either consciously or unconsciously they weigh the rewards against the extra time and effort required and decide it's not worth the price.

Another requirement for leadership is the ability and willingness to work with groups. There is relatively little that one can do as an individual toward changing practices or bringing about progress. It is always possible to extend one's influence, however, by joining with others who have similar goals. In other cases, one must form his own group, by sponsoring ideas and activities which will attract the loyalty and support of other like-minded individuals. The potential leader should always remember that there is strength in numbers, and however much one may admire the hardy individualist and the lone wolf, he is rarely a leader in the sense that he can persuade others to go his ways. True leadership is, and always has been a social function, and hence must deal with, and work through, groups working toward a common goal.

Most important among the attributes of a leader is courage — courage to fight for what one believes to be the best interests of his cause. There is an old proverb which says, "An army of stags led by a lion is better than an army of lions led by a stag." No matter how worthy the cause that is being advocated, there will always be those who oppose. It is always necessary, therefore, that there be leaders who are not afraid to speak and to fight for our principles. Leadership is not for the meek. Rather it is for the man who has such a burning conviction that he is ready and willing to do battle whenever needed for his cause.

Closely related to the need for courage is the requirement that a leader must be willing and able to accept responsibility. If one is to have any recognition either from individuals or groups, he must have a reputation for seeing things through. One who accepts an office or a responsibility in any group, and then (as one so frequently sees happen) does nothing about it, will not often get the second opportunity to show what he can do. If, on the other hand, one is given a small responsibility, and if he carries it through unusually well, it is only natural that more and greater responsibilities will soon come his way. Many promising young men in our profession have failed to inspire their co-

workers with a confidence that they could be trusted with responsibilities.

A Leader Must Be Able to Speak and Write

Finally, a true leader must be articulate. He must be able to write or speak in a way that will be convincing and that will move to action. If a person is a clear, concise writer, and if he is, in addition, a fluent speaker he can go far as a leader in his chosen field, because he has the tools and ability to inspire others to progress. It is rather infrequent, however, than one finds this combination. More often one finds those who can speak but cannot write, or those who can write but cannot speak. One who aspires to leadership should try to perfect himself both as a speaker and as a writer, for thereby he will have a double chance for success. If he finds, however, that his talents run definitely in one direction or the other, then he should concentrate on, and perfect himself in, the particular field of expression in which he is most adept.

And it is not enough, of course, that one be able to speak or write, but he must actually exercise his abilities. We need more people who can speak out for our profession — to the general educators, to the administrators, to the legislators. And we need more people who can and will write about our program, both for our own benefit, and for other groups who may not be informed of our aims and purposes. One of the weakest links in our program for the preparation of industrial-arts teachers appears to lie in the fact that we do not stress nearly enough the need for our prospective teachers of industrial arts to become clear, lucid writers and convincing speakers.

Now, it is hoped that the standards for leadership in our profession have not been set so high that one may be impressed that achievement of this goal is beyond the reach of most. There is always the danger in setting up criteria that one gives the impression that every criterion must be met. This is rarely the case. Some of the criteria may be possible for one but not for another. The more nearly one can come to achieving all of them, however, the more extensive his success is likely to be. However, leaders have been able to contribute much to the profession because they were really superior in only one or two of the characteristics which have been outlined. One should not hesitate to aspire to leadership even though he may not feel that he can qualify in every respect.

And lest you should think that leadership is all *give* and no *take* one should point out some of the rewards of being a leader. In the first place one has the satisfaction of feeling that he is performing a service to the cause for which he is working. To really experience life in its true sense each must have a mission to accomplish. And while the follower may rationalize and say that without followers there could be no leaders, yet he never feels the thrill of satisfaction which comes to the leader when he sees his cause advanced.

Then, too, the psychologists tell us that the most important drive to human action is the desire for self-approval and a feeling of success. While most people succeed in securing this feeling of self-satisfaction to some degree, in one way or another, the leader has a much greater opportunity to feel that he is accomplishing something worth while.

And not to be entirely forgotten is the fact that, over a period of time, there are usually financial returns for leadership. In general leadership tends to be recognized and people are willing to pay for vision and ability. Such financial return may come through appointment to a better position as a recognition for leadership, or as payment for speeches and writings. While true leadership seldom develops where a desire for monetary returns is the only motivating force, it remains a fact, however, that financial returns are usually forthcoming where true leadership is displayed.

To Survive, a Profession Must Have Leaders

Perhaps my most important reason for urging young men to aspire to leadership in industrial arts, however, is the fact that if the profession is to survive and continue to grow it must be constantly fed and nurtured by new and virile leadership. We must have coming forward an ever increasing band of young men who are able and willing to bear the banner of our profession and push onward to greater and greater achievements.

And finally, just a word about the techniques of leadership. How should a young man go about developing himself as a leader? In the first place he must decide that he wishes to be a leader and that he has the necessary qualifications. Having decided this he must take every opportunity to exert leadership. Naturally one does not become a national leader overnight. It is usually necessary to begin at the local level. No matter how small the unit with which a person may be connected, however, there will always be some group with which he can work. Then, of course, he must make himself felt in the group. He must, as has been stated before, be articulate. This does not mean that one should talk just for the sake of talking. It does mean, however, that when issues on which he has an opinion are raised he should make known his stand. From such small beginnings, in local situations, will come the recognition necessary to move on to larger and larger groups.

It is not necessary that one become nationally known to perform the service of leadership to the profession. While it is assumed that the more effective leaders will eventually rise to national prominence, it is never the less true that leadership is needed and essential at all levels, and the person who develops and organizes in his own town, county, or state, may be doing as important work as one who participates in the national program. The essential thing is that the work be co-ordinated and systematic at all levels, and that all leaders work together for the betterment and progress of the profession.

The first sawmill of the West, built in 1827 at Fort Vancouver, Wash., by the Hudson Bay Company, used a water wheel powered muley saw which rose and fell much like a single blade of the present day gang saw. — *National Lumber Manufacturers Association.*

Automobile models made by interested students

Evaluation of Teaching Methods to Provide Occupational Information

R. W. EDMISTON and
A. W. SCRIVNER
Miami University
Oxford, Ohio

An exhaustive study conducted by the Occupational Information and Guidance Service of the United States Office of Education indicated that guidance service was being received by about 28.7 per cent of the approximately 7,166,000 students enrolled in the white schools of the nation.[1] The lack of guidance that is evident from the report has been suggested as one of the reasons why one youth out of every four leaves school[2] before graduation.

Each year about 1,750,000 boys and girls in the United States offer their services as beginning workers, and most of these workers have very little information about the world of work because they have had no vocational guidance.[3]

Since the guidance of youth has a very direct relationship to individual welfare, family well-being, and national strength and progress,[4] information about occupations should be given through systematic courses especially planned for the purpose.[5]

George E. Myers wrote that "an adequate program of public education is impossible without vocational guidance."[6] In order to have an adequate program, there is a need for controlled experiments in different methods of teaching vocational guidance information to high school students.

Pamphlets, films, visitations, and speakers constitute four basic materials or methods which have been used to teach occupational information. The authorities do not state which method has the greatest value in providing occupational information. Therefore, this study was made to ascertain the relative value of films, speakers, pamphlets, or visitations to the provision of occupational information in high school vocational guidance classes.

Four different classes were used for the study. The enrollments of the different classes were 38, 39, 39, and 28, respectively.

The vocational fields chosen for the study were hotels, aviation, steel, and printing because of their proximity and their diversified nature.

The tests for each occupation were constructed from the films that depicted the specific occupations. The questions were designed to cover the procedures of the industry, the importance of the industry, the types of employees of the industry, the desired characteristics of the employees of the industry, the occupational hazards of the industry, and the benefits derived by the employees from the industry.

The outlines which were constructed from the film that depicted the specific occupations were used to guide the speakers in their discussions, to help in deciding what visits to make, and to assist in the selection of the pamphlet material.

The films used were published by Vocational Guidance Films, Inc., Des Moines, Iowa. They were chosen because all four of the films covered the procedures of the industry, importance of the industry, natural resources used by the industry, types of employees used in the industry, desired characteristics of the employees of the industry, occupational hazards of the industry, and also all of the benefits derived by the employees from the industry.

The pamphlets selected were published by the Science Research Associates, 228 S. Wabash Ave., Chicago 4, Ill., in their series of *Occupational Briefs on America's Major Job Fields*. In addition to the discussion of various aspects of each industry, there was also a list of additional sources of information. Related organizations, periodicals, and selected references were included in each pamphlet.

The four films were shown to the classes during forty-minute classroom periods. The four visitations took place at the different plants and they were allowed forty minutes for completion. The speakers were procured from the same industries that conducted the visitations. Each speaker was allowed forty minutes to cover the outline of the industry he represented. The pamphlets were given to the students in the classroom and the students were allowed forty minutes for reading and study. After each part of the experiment was presented to the students the test covering the industry studied was presented in the classroom the following day.

The chart which follows, is a pictorial presentation of the methods used, the occupational fields studied, and the order of procedure by the classes, A, B, C, and D. The methods were rotated in order to have each class use each method only once during the evaluation.

	Film	*Speaker*	*Pamphlet*	*Visitation*
Hotel	A	B	C	D
Aviation	B	C	D	A
Printing	C	D	A	B
Steel	D	A	B	C

By examining the chart it can be seen that every member of each group received a score by each method; this led to scores for the total group of 144 pupils by each method. Since the pupils were the same in each group, there was no problem of equalizing groups.

The following chart is a list of the comparisons of the differences of two means

[1] Royce E. Brewster and Walter J. Greenleave, "Roll Call of Counselors," *Occupations*, XVIII (Nov., 1939), pp. 83–89.
[2] Howard M. Bell, *Youth Tell Their Story* (Washington: American Council on Education, 1938), pp. 64–66.
[3] Howard M. Bell, *Matching Youth and Jobs* (Washington: American Council on Education, 1940), p. 25.
[4] F. Theodore Struck, *Vocational Education for a Changing World*, (New York, N. Y.: John Wiley and Sons, Inc., 1945), p. 312.
[5] *Ibid.*, p. 324.
[6] George E. Myers, *Principles and Techniques of Vocational Guidance* (New York, N. Y.: McGraw-Hill Book Co., Inc., 1941), p. 89.

obtained following the different methods indicated.

	No.	Mean	S.D.	$S.D_M$	Diff. $S.D_{Diff.}$	C.R.
Speakers	144	72.69	3.89	.32	3.61	8.38
Visitations	144	69.08	3.56	.29	.43	
Speakers	144	72.69	3.89	.32	8.49	18.45
Pamphlets	144	64.20	3.83	.32	.45	
Speakers	144	72.69	3.89	.32	12.05	24.59
Films	144	60.64	4.45	.37	.49	
Visitations	144	69.08	3.56	.29	4.88	11.90
Pamphlets	144	64.20	3.83	.32	.43	
Visitations	144	69.08	3.56	.29	8.44	18.35
Films	144	60.64	4.45	.37	.46	
Pamphlets	144	64.20	3.83	.32	3.56	7.26
Films	144	60.64	4.45	.37	.49	

All critical ratios indicated true differences between the test means obtained after the different methods of instruction. The order of efficiency of methods was (1) speakers, (2) visitations, (3) pamphlets, and (4) films, respectively.

A different time limit, differences in the relative motivation of the material of the four methods, and differences in the relative effectiveness of the presentation of information by the four methods could bring fluctuations in the results of similar experiments. However, the rather decisive conclusions presented by the critical ratios indicated that the relative improvement of the less effective teaching methods would have to be quite definite, especially if the forty-minute period is to remain the time limit for the instruction.

A Junior High School Principal's Viewpoint of the Industrial Arts

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For a number of years, I have been one of the speakers in the in-service course, "Selected Problems in Administration and Supervision of Junior High Schools." The particular subject assigned to me and to a fellow lecturer representing the Bureau of Vocational Activities has been "Problems in Industrial Arts." This topic has always provoked a great deal of discussion, accompanied, at times, with some heat. It is my hope, in this article, to clarify the attitude of principals with reference to the problems in industrial arts in the junior high schools in order to avoid causes for misunderstanding.

Many of the principals of junior high schools are products of a long and varied academic educational training. The industrial-arts program is essentially different from that which has an academic background. There is a tendency on the part of many principals, as a consequence of this lack of familiarity with shop techniques and skills, to avoid too many visits to the shops in their schools. This fear of embarrassment on the part of principals may, at times, lead to lack of complete knowledge and understanding of the industrial-arts program and its problems.

There is another cause for possible misunderstanding. Principals are not always sympathetic with the special considerations which must be given industrial-arts teachers in many phases of school life. These teachers are usually excused from supervision of home-room classes — a relief from many burdensome clerical and administrative duties which all others are expected to assume. In addition, the registers of industrial-arts classes are about one half to two thirds the size of subject classes taught by teachers of other subjects.

The following is another possible source of annoyance. Principals have been encouraged to introduce as few departmental subject changes in the seventh year as possible in order to bridge the gap between the elementary school organization and that of the junior high schools. Furthermore, the core curriculum now in use in many of our junior high schools emphasizes the integration of subjects under the aegis of one teacher. To emphasize and implement this trend, common branches was added to the teacher's specialty as a requirement for the license of teacher in a junior high school. It is, therefore, very disconcerting to principals to learn that teachers of industrial arts or their directors may not be in complete agreement with this program. This interferes with flexibility of assignment and to some extent, hampers the extension of the industrial-arts program.

It is recognized by principals and other educational leaders that industrial-arts teachers are fortunate in that they teach subjects which have a natural fascination and intense motivation for most of the pupils of junior high school age. Teachers of these subjects are fortunate too that they are spared the preparation and rating of written papers which are often the lot of other teachers.

Industrial-arts teachers, on the other hand, maintain that they are performing exceptionally well, under difficult conditions, a most necessary and extremely important job. They are expected to have their shops, the materials, and the tools of their shops in first class condition both as a requirement of good housekeeping and as an example of good workmanship. The preparation of projects for the day's work and the proper housekeeping very often

consume the so-called unassigned periods mentioned above.

Furthermore, they do not like to be called "shop" teachers, a term which does not always imply that they are teachers of children rather than teachers of a subject. They should like to be considered favorably for promotional preferment, especially since they are meeting the higher cultural requirements set for teaching positions. In addition, they wonder why such a large and disproportionate number of slow pupils must be assigned to their subject classes while the bright and the normal are guided into more of the traditional subject fields.

The supervision of classes passing in the corridors during subject period changes is a cause for further misunderstanding. Industrial-arts teachers believe that they should not be away from their rooms, at any time, due to the dangers involved.

These teachers, furthermore, point with pride to contributions made by them willingly and graciously to all types of community and school projects. In addition, they have overcome many of the educational obstacles and are now participating fully in the broad pedagogical and administrative phases of school life.

In the light of the discussion, the following principles should be emphasized and accepted. The industrial-arts program is an essential facet of our rich educational curriculum. Distinctions based on preparation or background are outmoded and have no place in a progressive, democratic society. Every teacher whether *shop* or *academic* should be encouraged to develop his talents and abilities to the utmost. Promotional preferment should be based on accomplishment and capability, not on some extraneous qualities.

In addition, it is accepted practice to have fewer pupils in shops than in academic classes. Safety, individual help, the use of tools, the need for individual and group demonstrations, and the required room to work at benches are a partial list of valid reasons for smaller registers in shops. This should be willingly accepted by all.

On the other hand, teachers of industrial arts must accept their positions as teachers not only of industrial arts but also of children, with all the implications involved. They should accept willingly and even gladly all pupils who would benefit from a program of industrial arts whether bright, normal or slow. They must participate fully in all the other phases of a rich school life.

It might be helpful to principals to know that the Bureau of Vocational Activities is aware of the reluctance that some of them have to visit the shops in their schools. They do not think the principals should hesitate to make these supervisory visits even if they lack the special knowledge required. The principles of education apply equally as well in the shop and in the classroom. The principals may be completely ignorant of shop techniques and still be able to evaluate the work of the shop teacher.

In conclusion, it should be emphasized that there has been a noticeable change in requirements for the position of teacher of industrial arts, with greater emphasis on teaching and educational requirements and less on shop experience in the trade. The new appointees, eager and enthusiastic, are welcome additions to this broad field of educational endeavor. They can be certain that every opportunity will be given them for full development in their chosen field.

Techniques for Development of a Democratic Program

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Educational leaders can encourage the individual growth of professional personnel when they are willing to recognize that "we can do the job together better."

A few principals feel that they are providing for individual teacher expression and a democratic procedure, when they appoint committees and charge them with the responsibility of carrying on certain work that perhaps could be done by someone in the school office. This only keeps teachers from doing essential work with their students, and is little more than an expedient procedure for the rubber stamp technique.

Faculty meetings could be planned using panel and discussion techniques so that individuals are encouraged to express their ideas. The chairman might be a classroom teacher and each member of the faculty could be made to feel that he *belongs* and is important to the success of the entire program. More opportunity should be provided for teachers to meet with their colleagues and discuss their instructional program in terms of how it could be done better and how it contributes to the entire educational program within the school. Administration should make every effort to act on suggestions that are thought through and projected by the majority.

Probably the most important technique that can be employed is genuine interest by the administration in the classroom work of each teacher. Teachers should be encouraged to talk their plans and problems through with the principal and department head.

Although it owns only 8 per cent of the world's commercial forest area, the United States produces 44 per cent of the world's lumber, 58 per cent of its plywood, and 43 per cent of its wood pulp. — *National Lumber Manufacturers Association.*

Many traffic safety experts believe the total of injuries, not deaths, is the real mirror of progress in accident prevention. Here is America's ugly reflection in the mirror of traffic injuries:

1946: 1,302,000 persons injured
1947: 1,365,000 persons injured
1948: 1,471,000 persons injured
1949: 1,564,000 persons injured
1950: 1,799,800 persons injured

Preparation and Upgrading of Industrial-Education Personnel

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Chico, Calif.

(Continued from page 256 of the June, 1951, issue)

Industrial Majors and Minors

Among the institutions there is wide variation in the requirements for bachelor's degrees with respect to the required fields of work and the number of semester hours of credit in each field. The number of areas of manipulative work (woodwork, drafting, metal, etc.) available to students in industrial-education departments varies from 1 to 17 with a middle 50 per cent range from 4 to 8, a mean of 6, and a median of 5 areas. The mean number of areas in which industrial-arts majors are required to take work is 4.8 and for industrial-arts minors is 3.2 areas. For vocational-industrial majors the mean number of areas in which manipulative work is required is 3.7 and for vocational industrial minors is 2.4 areas. The A. & M. colleges offer work for industrial-education students in the largest number of areas. This, no doubt, can be partly explained by the existence of engineering shops.

For a major in industrial arts the median institution requires 29.5 semester hours of required shop courses, 10 of elective shop courses, 6 of required theory, and 3.5 of elective theory courses. For a minor in industrial arts the median institution requires 16 semester hours of required shop courses, 8 of elective shop courses, 4 of required theory, and 4 of elective theory courses.

For a major in vocational industrial education the median institution requires 28 semester hours in prescribed shopwork, 8 in elective shop courses, 18 of prescribed theory, and 6 of elective theory courses. For a minor in vocational-industrial education the corresponding amounts are 15.5 semester hours of prescribed shop courses, 6.5 of elective shopwork, 7 of required theory, and 6 of elective theory courses.

A variety of courses and services are offered in institutions receiving federal aid for craftsmen before and during their teaching careers. These are professional and related technical in nature, rather than manipulative in content as commonly provided for degree candidates. Occupational competence is assumed and time is given only to learning to teach and improving the work in hand.

Approximately one third of the institutions grant credit for trade or occupational experience. Special examinations and employers' records are the two most frequently mentioned techniques used to evaluate such trade experience. The median number of credits granted for trade experience for industrial-arts majors is 9 and for vocational-industrial arts 15.5.

Useful Activities

Eighty per cent of 107 industrial-education departments providing this information sponsor clubs or fraternities. There is an increase in this activity. The number of such organizations range from 1 to 4 per institution with a mode of one club.

Staff members of industrial-education departments of teacher training institutions have found field trips, work experiences, industrial contacts, school visitation, and other off-campus contacts very helpful in training industrial arts and vocational education teachers.

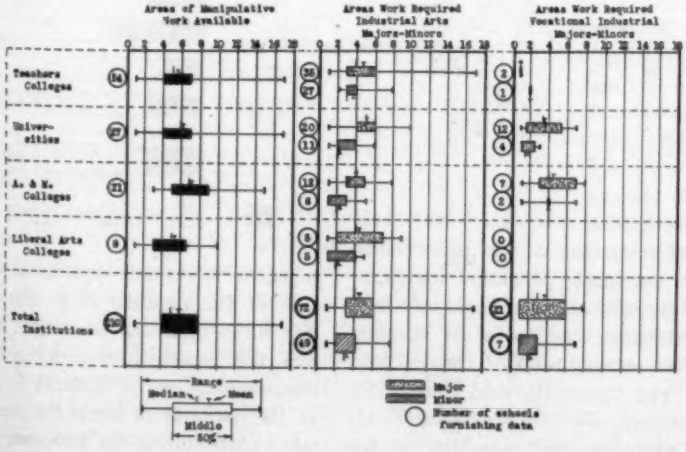
Fifteen per cent of 132 industrial-education departments reported that they are required to carry on production work. Many of the other departments, not required to carry on production work, do so when it has educational value.

In the majority of the institutions the instructors are responsible for the maintenance of equipment. Many have the assistance of students in the courses, students hired for the purpose, and special millwrights.

Most frequently mentioned future plans concern the securing of additional space and equipment, increasing the staff, initiating new programs, reviewing and enriching present offerings, and expanding the total offerings.

FIGURE 33

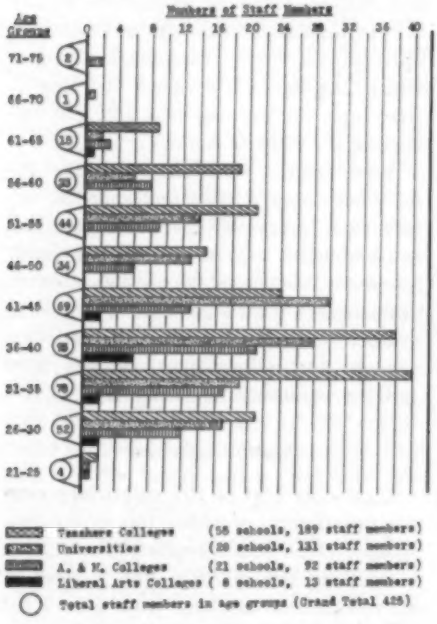
AREAS OF MANIPULATIVE WORK (WOODWORK, DRAWING, METALS, ETC.) AVAILABLE IN INDUSTRIAL EDUCATION DEPARTMENTS AND THE NUMBERS OF AREAS REQUIRED FOR MAJORS AND MINORS



Staff Members

Size. The median staff size in the teachers' colleges is 5 members; in universities 7; in A. & M. colleges 8; and in liberal arts colleges 3. The over-all median staff size is 5. The trend in staff size seems to be toward slight increase or no change.

COMPARISON OF AGES (1948–1949) OF INDUSTRIAL EDUCATION STAFF MEMBERS IN VARIED TYPES OF INSTITUTIONS



Ages. The ages of 425 staff members of industrial education teacher training departments range from 21 to 71 years with a middle 50 per cent range from 34 to 49.5, a mean of 41.7, and a median of 40 years.

Formal Preparation. The highest educational attainments of 528 staff members are as follows: 16 (3 per cent) diplomas or certificates, 125 (24 per cent) bachelor's degrees, 339 (66 per cent) master's degrees, and 38 (7 per cent) doctor's degrees. The median dates when these educational attainments were reached are: 1925 for diploma or certificate, 1935 for bachelor's degree, 1940 for master's degree, and 1941 for doctor's degree.

Previous Education Experience. An analysis of the teaching experience of 528 college staff members reveals the following facts. Seventeen per cent have taught shop subjects and 14 per cent other subjects on the elementary school level. Sixty-three per cent have taught shop subjects and 25 per cent other subjects on the secondary school level. Thirty-two per cent have had experience in vocational schools. Seventy-three per cent have had teaching experience of some kind prior to college teaching, while 27 per cent have had no teaching experience prior to college teaching. Nineteen per cent have had administrative experience on the elementary-secondary level and 18 per cent on the college level. Sixty-four per cent have had earning experience in fields other than education.

Service Terms. The lengths of service in present positions reported for 429 staff members range from 1 to 44 years with a middle 50 per cent range from 2 to 10, a mean of 8.1, and a median of 3 years. In addition to these, 31 staff members were reported having less than one year of service in their present positions.

Loads and Salaries. Some of the staff members teach theory (classroom) courses only (13 per cent), some shop (manipulative) courses only (41 per cent), and some both shop and theory courses (46 per cent). Staff members who teach both shop and theory courses carry a median instructional load of 21 hours per week; those with shop courses 20 hours per week; and those with theory courses 10 hours per week.

RANK ORDER COMPARISON OF 20 STAFF PROMOTION ITEMS AND CRITERIA AND THOSE APPROVED BY STAFF MEMBERS INVESTIGATING VARIED INSTITUTIONS THAT TRAIN INDUSTRIAL TEACHERS

Items Considered (126 persons)
Degrees held (education) 1.
College teaching experience 2.
Number of years on the staff 3.
Professional attitude and leadership 4.
Ability to teach 5.
Personality and ability to get along 6.
Knowledge of subject matter 7.
Occupational experience 8.
Personal appearance 9.
Care of shop—equipment and materials 10.
Elementary and secondary school teaching experience 11.
Quality of student work 12.
Educational activities out of school 13.
Publications 14.
Extra-curricular activities within the school 15.
Student opinion of the instructor 16.
Teaching load 17.
Non-teaching activities in the department 18.
Participation in faculty social functions 19.
Wife or family 20.
Items Answered (117 persons)
1. Degrees held (education)
2. Ability to teach
3. Professional attitude and leadership
4. Knowledge of subject matter
5. Personality and ability to get along
6. College teaching experience
7. Occupational experience
8. Care of shop—equipment and materials
9. Elementary and secondary school teaching experience
10. Quality of student work
11. Number of years on the staff
12. Personal appearance
13. Educational activities out of school
14. Publications
15. Extra-curricular activities within the school
16. Teaching load
17. Student opinion of the instructor
18. Non-teaching activities in the department
19. Participation in faculty social functions
20. Wife or family

The three most frequently used techniques for upgrading college instructional staffs are: conducting personal conferences, urging attendance at professional meetings, and supporting attendance at summer schools and evening schools. Degrees held are the most frequently used criteria for staff promotion. The median salary of industrial education staff members for the full year is $4,100 and for the academic year $3,300.

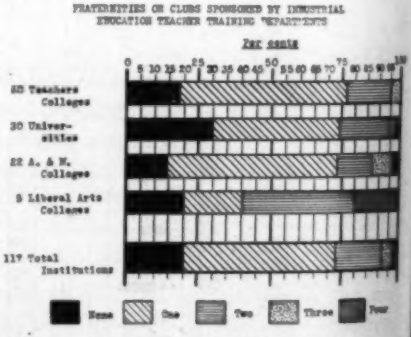
Enrollees

Grade Levels. The 18,313 students reported by 125 collegiate institutions for the year 1948–49 fall into the following grade levels: unclassed 1375 (7.5 per cent), freshmen 5083 (27.7 per cent), sophomores 4450 (24.3 per cent), juniors 3685 (20.2 per cent), seniors 2900 (15.8 per cent), fifth-year students 748 (4.1 per cent), and beyond fifth-year students 75 (.4 per cent).

Extensive use is made of the industrial-education training facilities by other divisions of the institutions. Courses are offered in support of such programs as: other phases of education, engineering, art, agriculture, and science.

Recruiting. Participants in teacher training institutions feel that, of the 32 techniques reported as having been used, the three most helpful in securing good students for their industrial-education departments are: recommendations of teachers in the field, higher salaries for teachers in the field, and improved instruction within the colleges. At present the three criteria most generally used for the selection of candidates for training are: graduation from an accredited high school, intelligence tests (whole college), and vocational interest scores. Participants favor graduation from an accredited high school, scholastic rank in high school, and character-personality descriptions. For admittance to the average and the median collegiate institution approximately 25 per cent of the required high school credits may be in industrial education. Less than half the reporting institutions indicated that *weeding out* of students is practiced. In the majority of these the weeding out takes place during the first two years.

FRATERNITIES OR CLUBS SPONSORED BY INDUSTRIAL EDUCATION TEACHER TRAINING DEPARTMENTS



Degrees and Placements

Awards. In the 1947–48 school year 1483 students earned bachelor's degrees with majors in industrial education at 105 institutions, and 403 with minors at 47 institutions. Master's degrees with majors in industrial education were awarded to 265 students by 32 institutions and with minors to 42 students by 9 institutions. Doctor's degrees with majors in industrial education were earned by 8 students in 5 institutions and with minor by 1 student.

Placements and Subsequent Contacts. Graduates with bachelor's degrees were most frequently placed in senior high schools and junior high schools. Those with advanced degrees were most frequently placed in senior high schools and in colleges and universities. Graduates were aided in securing these educational positions by school placement bureaus, department faculties, friends, commercial teachers' agencies, and others mentioned less frequently.

As reported by the training institutions the median of average academic-year salaries accepted by bachelor's degree graduates was $2,750 with a middle 50 per cent range from $2,500 to $3,000. For those with master's degrees the median of average salaries per academic year was $3,200 with a middle 50 per cent range from $3,000 to $3,460. Three institutions reported the average salaries accepted by graduates with doctor's degrees as $4,000, $4,500, and $8,000.

Postgraduate contact is most frequently maintained by industrial-education departments by means of newsletters and bulletins, students returning to campus, and personal contacts by staff members. The importance of postgraduate contacts is emphasized by the fact that only 5 of the 124 respondents stated they have no plans for maintaining such contacts.

(To be continued)

Leaders in Industrial Education

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(Continued from page 230 of the June, 1951, issue)

CHARLES RICKETSON ALLEN

Charles R. Allen will be remembered as the director of one of the early vocational schools, the Independent Industrial School of New Bedford, Mass., 1909–11; as the associate of Dr. Charles A. Prosser in the pioneering work of organizing the state system of industrial schools in Massachusetts, 1911–12; as an important member of the technical staff of the Federal Board for Vocational Education during the critical period following its initial organization, 1918–34 (with some interruptions of service); and as the author and coauthor of a series of influential books in the formative period of the movement for vocational education. Interspersed with these major undertakings, he filled in a number of assignments which can be called minor only in a relative sense.

In all these enterprises, he ranked high in the esteem of his associates, all of whom regarded him as an outstanding pioneer in vocational education in this country. "As much as any other man, he has determined the philosophy of the movement, and he has displayed the most originality in the invention and use of devices and methods for getting the job done." Dr. Prosser expressed the consensus of those who were qualified to evaluate his work, when he said: "He has been analyst and thinker, confidant and conference leader, consultant and textbook maker, and through it all he has been personal adviser and friend. No man has contributed more than he to sound thought regarding the purposes and methods of vocational education, and at the same time no other man has contributed more than he to original methods and devices for giving efficient training in vocational education."[1]

First Meeting

I first met Mr. Allen at the convention of the old National Society for the Promotion of Industrial Education, which was held in Milwaukee, Wis., December 2–4, 1909. In September of that year he had been named director of the newly organized Independent Industrial School, in New Bedford, Mass. This appointment had come about because he had taken the initiative three years earlier in developing a program of evening trade-extension classes for workers in the electrical trades. The energy, enthusiasm, and organizing ability displayed in this venture resulted in his appointment as director of evening industrial classes, then as director of the Industrial School, and director of vocational education for the entire city.

At the Saturday morning session of the convention in Milwaukee, held in one of the assembly rooms of the municipal auditorium, Mr. Allen spoke on "Intermediate Industrial Schools." I remember very well looking over the printed program of the convention, which always included more events than any one individual could possibly take in, and I decided that this Saturday morning session was a "must," because I had been reading about the system of independent industrial schools that was

[1]Charles A. Prosser, in an address at the annual banquet, American Vocational Association, Los Angeles, Calif., Dec. 1927.

being set up in Massachusetts under a new law, and especially about the pioneering work of Mr. Allen in organizing and directing one of the first schools in New Bedford.

The details of what Mr. Allen said on this occasion have been dissipated with the passing of more than 40 years, but I recall very well the impression of listening to one who "knew what he was talking about." In the discussion that followed his talk, he displayed familiarity with the problems, and mastery of the procedures for solving them. We were to meet again many times later, but now let me set down an outline of the essential facts concerning his career.

Allen was a man of medium height, five feet, four or five inches, and weighed possibly 150 to 160 pounds. Brought up near the sea, he was always interested in boats, both sailboats and motorboats, in the management of which he was an expert, and in saltwater fishing.

By temperament he would be described as of the quiet, reserved, contemplative type. He was not an orator, but in his quiet way he was a very effective speaker, because of the evidence he always gave of careful preparation and purposeful thinking. In a conference he was seldom aggressive in presenting his views, but his contribution was always to the point.

Early Life

Charles R. Allen was born in New Bedford, Mass., August 6, 1862, and died, July 15, 1938, following a heart attack on the return trip from Daytona Beach, Fla., to his home in San Antonio, Tex.

He received his early education in Friends Academy and High School, New Bedford. He was a graduate of Massachusetts Institute of Technology, with the degree B.S., 1885, specializing in chemistry. He later completed graduate credits at John Hopkins University, Baltimore, Md., and at Harvard University, where he received the M.A. degree in 1903. He was awarded the honorary degree, D.Sc., by The Stout Institute, Menomonie, Wis., in 1927.

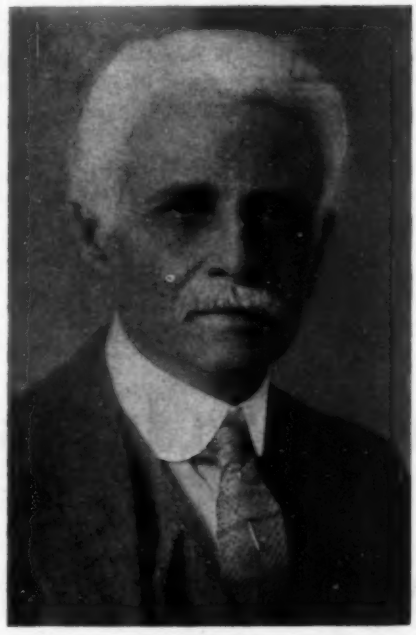
For one year, 1885–86, he was assistant in the laboratory of general chemistry at Massachusetts Institute of Technology, and private assistant to Professor Wolcott Gibbs.

For 23 years, 1886–1909, he was teacher of science in the public high school in New Bedford, becoming head of the department of applied science in 1908. During this period he served also as principal of the Evening Electrical School, 1906–07; and was appointed director of evening industrial classes in 1908. From 1909–11, he served as director of vocational education in the city schools, and director of the New Bedford Independent Industrial School.

From 1911–17, he was agent for industrial education, State Board for Vocational Education, Boston, Mass., and served as acting deputy commissioner for vocational education for one year, 1912–13, to fill the interim between Dr. Prosser's departure to accept the position as executive secretary of the National Society for the Promotion of Industrial Education, and the appointment of Robert O. Small as his successor as deputy commissioner.

In the fall of 1916, he was a member of the staff employed to make an educational survey of Hampton Institute, Hampton, Va., with recommendations concerning the policies and offerings of that institution. He served as visiting professor of vocational education in the Summer Session at Harvard University in 1915 and 1916.

After World War I broke, Allen was loaned to the staff of the Emergency Fleet Corporation, where he served as superintendent of instructor training for 13 months, from October, 1917, to November, 1918.



Charles Ricketson Allen

From November, 1918, to August, 1920, he was special agent for industrial education, Federal Board for Vocational Education, Washington, D. C.

For one year, 1920–21, he was loaned to the Chamber of Commerce, Niagara Falls, N. Y., as director of training in industry. In 1921–22, he returned to his assignment with the Federal Board.

For two years, 1922–24, he was director of industrial training service, William Hood Dunwoody Industrial Institute, Minneapolis, Minn.

From September 15, 1922, to March 15, 1923, at the urgent request of the Federal Board for Vocational Education, Allen was granted leave of absence from Dunwoody Institute to conduct a number of important conferences in Washington. Among these was a series of conferences with officers of the United States Navy, discussing the problem of devising ways and means of establishing teacher-training courses for officers in charge of enlisted men on shipboard. The method adopted was to use the book, *The Instructor, The Man, and The Job*, as a basis of discussion, with the view to determining how far and in what ways the principles and methods therein set forth are applicable to conditions on shipboard. In March, 1923, upon the conclusion of the conferences, Allen returned to Minneapolis.

In 1924, he returned to Washington, D. C., to the Federal Board for Vocational Education, as editor and educational consultant. During the period of his connection with the Federal

Board he was in frequent demand as a conductor of short courses and conferences on the training of foremen and mechanics in industrial plants. He served several engagements as visiting lecturer in the summer sessions at Colorado State College, Fort Collins, and elsewhere.

He retired in 1934, after which date he spent some time in Florida waters with his motorboat, which he sailed down the "inside passage" from New England. Later he made his home in San Antonio, Tex.

He was active in professional organizations, including: American Vocational Association and its predecessors, American Management Association, American Chemical Society, Eastern Association of Physics Teachers, New England Association of Chemistry Teachers, Harvard Teachers Association, and others. He was a member of prominent clubs, including: Dartmouth Club, New Bedford Yacht Club, Brooks Club, Technology Club.

He was author of a *Laboratory Manual of Physics*, 1890; *The Instructor, The Man, and The Job*, 1919; *The Foreman and His Job*, 1921; *Vocational Education in a Democracy* (with C. A. Prosser), 1925; *Supervision of Vocational Education* (with J. C. Wright), 1926; *Administration of Vocational Education* (with J. C. Wright), 1926; and *Efficiency in Vocational Education* (with J. C. Wright), 1928. For two years, 1922–24, he was a member of the editorial staff of the *Vocational Education Magazine*, published by the National Society for Vocational Education.

The Staten Island Conferences

My next meeting with Mr. Allen was in 1913. In the spring of that year, the National Society for the Promotion of Industrial Education sponsored a four-day conference of leaders in industrial education and agricultural education from the staffs of the State Departments of Education within convenient distances from New York City. The conference was conducted by Dr. Charles A. Prosser, executive secretary of the Society, primarily for the purpose of making an intensive study of the problems of state legislation for the promotion of industrial education — a live subject in a number of states at that period.

The conference was repeated in the spring of 1914, and again in 1915. Later in 1915, Dr. Prosser resigned his position as executive secretary of the National Society to become director of the William Hood Dunwoody Industrial Institute, Minneapolis, Minn., and the conferences were discontinued.

To this conference in March, 1913, came members of the staffs of State Departments of Education of New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, and others, a total attendance of 18 to 20 men. I am unable to recall the others, but I believe at least ten or twelve states were actively studying problems of legislation at that time. The officers of the National Society rightly sensed the opportunity to render a vital service by bringing these men together, to compare notes, to pool resources and experiences, and to make genuine progress at a critical time in the development of the movement. I was most fortunate in receiving an invitation to the conference as one of the editors of *Industrial Education Magazine*.

Mr. Allen came as a member of the delegation from Massachusetts, and took a quiet but highly significant part in the proceedings from beginning to end. I well remember the morning following the first informal evening meeting. Breakfast was announced for 8:00 o'clock, but being an early riser I was down in the living room before 7:30. There, sitting before a cheerful blaze in the open fireplace, I found another early riser who had preceded me. Mr. Allen was sitting there alone, in a comfortable chair, quietly smoking one of the smelliest pipes I had ever encountered. He greeted me cordially, and we had a most agreeable visit until the other men came straggling in a half hour or so later.

The Instructor, The Man, and The Job

One of Allen's major contributions to the progress of industrial education was made through his book, *The Instructor, The Man, and The Job*, published in 1919.[2] In this book he developed a philosophy of the functions of the industrial teacher, needed qualifications and preparation of the teacher, organization of instruction materials, and methods of teaching, which has had wide acceptance. Among his contemporaries, the mention of Allen's name would almost invariably start a discussion of "the Allen method of analysis" of a trade or industry for the purposes of training workers, foremen, and instructors of workers.

The content and method of the book grew directly out of Allen's experience in solving these problems in New Bedford, and in helping others to solve them as he worked out of the State Department office in Massachusetts, and elsewhere. The estimate by other leaders of the value of Allen's work was well expressed by Dr. Prosser in the Introduction to the book: "I am of the opinion that this book is the most important contribution yet made to industrial and trade training."

Again, in the Preface to the 1945 revision of the book, Dr. J. C. Wright, assistant commissioner for vocational education, U. S. Office of Education, adds this comment: "At the eighth annual meeting of the National Society for the Promotion of Industrial Education, in Richmond, Va., December, 1914, Dr. Charles R. Allen first presented to the nation's leaders in vocational education his philosophy on the training of teachers. At this meeting he reviewed a page-proof copy of a manuscript which later became known as *The Instructor, The Man, and The Job*. . . . He was first of all an analyst, and then a philosopher."

It is impossible to review a book in a short paragraph, but considerable insight is afforded by summarizing Allen's concept of the industrial teacher, which he develops on page 117. It is evident that the man who cannot impart what he knows cannot be a successful instructor. It is equally evident that the man who can impart but who has nothing to impart is equally a failure. The successful instructor therefore must (1) thoroughly know what he is to teach and (2) be able to impart it effectively. In industrial training this means that the instructor must know two trades — his own and the teacher's trade — his own trade so that he will know what to teach, and the teacher's trade so that he will know how to teach it. Without a thorough command of *both* trades he will be a failure.

This pronouncement may be regarded as one of the most important blocks in the foundation of the program of vocational education, if indeed it is not the very cornerstone of the structure. That it expressed the earnest conviction of the early leaders is evident in the incorporation of this concept in the

[2]Charles R. Allen, *The Instructor, The Man, and The Job* (Philadelphia: Lippincott, 1919).

Smith-Hughes Vocational Education Act of 1917. As a concept it is convincing, and as an aim or ideal it is unassailable. The difficulties involved in translating it into reality have been endless. In practice it has been almost impossible of complete or general achievement. Because of the stimulus of subsidies, because of the urgent demands of expanding programs, and perhaps because of inherent difficulties, the administration of vocational legislation has not succeeded in making impossible the employment of instructors who are not, in fact, "masters of *both* trades."

(To be continued)

Picture Boards Help Students Learn to Think and Plan

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First class men in the industrial-arts field have long attempted to use shopwork as a means of helping students learn to think and plan for themselves. "One of your strongest objectives," these leaders will tell you, "should be to set up a learning situation in your shop where a boy can plan a project, select a course of action which will complete the project, and experience the satisfaction of creating something with his own hands." What a marvelous adventure is the modern general shop with its infinite variety of experiences. But if it is to be more than an unplanned adventure, if definite, worth-while goals are to be worked toward, then *teacher guidance* must be available all along the way and it is the instant availability to the student of this guidance which determines how a shop *stacks up* as a learning situation. That shop hums with purposeful activity where there is a wealth of guidance in the form of instructional aids; remove the aids and learning falls off fast. Let us see if we can discover why such a vast difference results from the use of visual aids.

It has long been pointed out that both the greatest strength and greatest weakness of the general shop accrues from its variety of activity. It is strong because the boy is launched into broad endeavors of human experience. He acquaints himself and manipulates manifold materials and processes. At the same time the weakness of the general shop is that one teacher cannot possibly teach many things at once. The need, then, is to aid the instructor with devices which will really instruct. The moment you step inside a general shop you see boys working at the wood lathes, metal lathes, forge, woodwork benches, welding booths, painting areas, etc. Nearly all need guidance with their work. In a day or two they will be at different machines, and then different machines again. How can one instructor be everywhere at once? Ah, but he simply must. At least, something must be done to place instruction in the reach of every boy, at the instant that he needs it and as often as he needs it, no matter what he may be doing. And it should be of a kind that the slowest learner can enjoy the feeling of success.

The author of this article has wrestled over the past 16 years with still and motion pictures, job sheets, step-by-step project developments, models, diagrams, etc., in a search for better instructional aids. Heretofore all types of aids have been shipwrecked on one or another of the following requirements of the perfect teaching aid:

1. It must be instantly and continuously available to one student or many and not block the use of other aids.
2. It must not depend upon words for instruction yet so instruct the beginner that *every* step is crystal clear to him.
3. It must be light in weight and easy to carry.
4. It must be entirely complete in itself.
5. It must be permanent, easily taken out and put away, and be reasonable in cost.

The *picture boards* developed in the general shop of the Burlingame High School go a long way toward meeting the requirements just mentioned. Figure 1 shows three boys operating the simple 35 millimeter camera and lighting setup used in making the negative roll. Figure 2 shows the writer in his lecture room going over the instructional aid on faceplate turning on the wood lathe titled "How to Turn a Bowl and Matching Lid." It gives a thorough explanation of the steps in the project, and originally a complete demonstration of turning a bowl and lid was given. However, the aid worked so amazingly well that the demonstration was discontinued on the ground that it was not needed. This is not to say that no demonstrations at all are given. They are, in the first week, carefully planned.

Figure 3 is the old story in the general shop, the single student wanting help with his project. It may be months before the boy goes to work at the wood lathe and he has, of course, forgotten completely every last detail of the original demonstration that was given. With the *picture board* in the position shown, how simple is a *refresher session* with the boy. You ask, "Do you see how this is done? And this, and this?" It is but a minute to explain any picture he has trouble with. A comparable demonstration might take half an hour, while the picture-board method takes but a minute.

Figure 4 shows the first six pictures of the visual aid. Each picture measures actually 4 by 4 in. and can be seen clearly from at least 3 feet. Figure No. 5 shows some projects made by students from visual aids already completed. It is com-

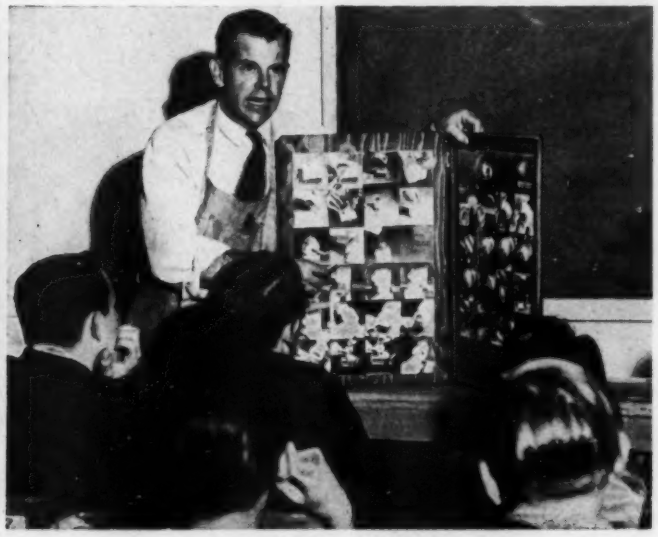

Fig. 1. (Left) Making the negative roll. Boys like to help with this work. Fig. 2. (Right) The writer in his lecture room with his class (24 students) going over an explanation of the visual aid — how to make a bowl and matching lid

mon for a boy to say, "I'd like to make a cold chisel for myself." You say, "Fine, get the picture board and we'll talk it over." A couple of minutes later he goes on his way and eventually brings back a chisel for your approval.

It is rather satisfying to the instructor to see the glow of success on the boy's face when you tell him, "Well, son, you seem pretty sharp at figuring things out for yourself." The next time he needs to use the forge, a file, emery paper, etc., he won't need the picture board, he will be on his own and very happy about it, too.

The question can be asked, "Where does a busy teacher find the time for making these boards." There is no easy answer. It is a lot of work, but once it's done, it's done. The number of hours that go into each teaching aid varies with the complexity of the project, with the greater portion being spent upon planning how each picture will be shot. This is a tricky job as each picture must really teach. Besides this they must be clear, sharp, and well lighted. Each picture must set forth safe and accepted ways of doing a job. This planning is done outside of school and usually takes about three to six hours on the average. The shooting of the negative roll, as shown in Figure 1, is done at odd times during the teaching day. Students quickly learn to handle the camera, lights, exposure, script board, etc. Film developing and picture printing is done at the writer's home. Mounting of the prints is done by students in class.

The writer has been approached to make large master negatives and have a commercial concern print 11 by 14-in. copy prints from them, available to other general-shop teachers at cost. These prints,

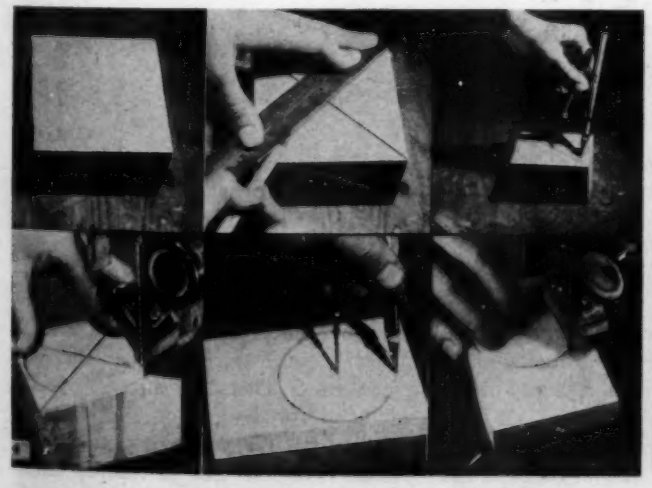

Fig. 3. (Left) A student who has forgotten how to proceed. With the visual aid, a minute's "refreshing" puts him under way again. Fig. 4. (Right) The first six pictures, full size 4 by 4 in.

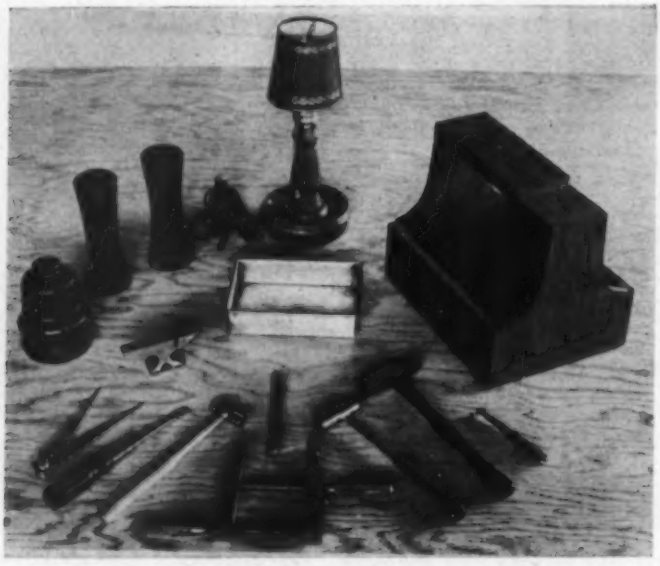

Fig. 5. Projects made by first semester students using the visual aids described by the author

plus plywood backing, will become teaching aids well worth having.

Following is a list of teaching aids either done or else under way. Some run up to a total of one hundred and thirty pictures each but on the average they can be wrapped up in about four dozen:

1. Bowl and matching lid — wood lathe
2. Table lamp, wired — wood lathe
3. Gavel — wood lathe
4. Machinist hammer — metal lathe
5. Center-punch or nail set — metal lathe
6. Machinist clamps — metal lathe
7. Plumb bob — metal lathe
8. Cold chisel
9. Center punch — hand forged
10. Dividers — bench metal practice
11. Riveting hammer — bench metal practice
12. Small anvil — bench metal practice
13. Paper punch — bench metal practice
14. Tie and slacks hanger — wood project
15. Shoeshine box — wood project
16. Small chest — wood project
17. Monel metal ring — bench metal project
18. Smoking stand — wood project
19. Garden trowel
20. Sheet-metal tool tray — sheet-metal work
21. Sheet-metal oil funnel
22. Oil measure
23. Hunting knife
24. Art metal bracelet

What about safety education in the shop; a topic that never can be hit hard or often enough it seems? It must be tied in with how you show each step on the job being done, if eyeshields are needed, show them being used. If fingers can be caught, show how to avoid such trouble.

While a vast amount of time will have been poured into the picture boards before they are all completed, it is a lot of satisfaction to see a class come in and go to work where they left off the day before. Some students will need help no matter what you do and these you get to first. After taking care of them you can circulate around and see how your more resourceful students are making use of the teaching aids you devised.

Blind Students in an Industrial-Arts Shop

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What is believed to be one of the first, if not the first, programs of industrial-arts training in the public school for blind children and adults is being carried out at the Ann J. Kellogg school.

The program, which seeks to provide sightless persons with a valuable avocation and eventually, perhaps, another means of livelihood, is supported by the Battle Creek Lions club, which has pioneered in a number of other programs for the blind, including physical training.

Training in the use of woodworking tools and machinery, whether for vocational or avocational purposes, is nothing new to publicly supported schools for the blind, but it appears to be a trail-blazing effort for general public schools, sponsors of the program say.

That the program can have a practical application in finding jobs for the blind has already been established. One of the adults who is taking the course is already employed in industry. He has come to school to learn additional skills and manual dexterity.

At present there are five adults and four school-age children enrolled in the program. Both adults and children are supervised by Harold Hooker, Ann J. Kellogg industrial-arts teacher. The children's group meets Thursdays after school, the adults on Tuesdays.

When the Lions club approached Mr. Hooker with the idea of teaching industrial-arts skills to the blind, he was frankly skeptical of the success of such a program.

Blind children in the industrial-arts class. Harold Hooker is the instructor.

The emotional appeal which such teaching held for Mr. Hooker led him to go ahead, however. Now, after he has tried the program, Mr. Hooker is confident, inspired, and amazed.

"I am amazed at the rapidity and the sureness with which both groups grasp the work. It's inspiring to see them move ahead in their learning without the one thing that would seem absolutely necessary for carpentry or machine operation. And I'm confident that this program can lead to jobs for the blind in industry, and that individuals so placed will honestly pay their way in such jobs," Mr. Hooker commented.

How to begin such a program? Mr. Hooker started off with a "tour" of the shop, letting each individual orient himself to the surroundings, having them literally "get the feel" of the tools and machines with which they were to work, and their location. Then came simple mechanical skills — squaring up boards, sawing, planing, driving a nail.

Soon the younger students were ready to undertake a project. Each began the construction of a wall rack. The project was a success. "Place the work of the nonsighted beside that of other students and tell me which is which!" Mr. Hooker challenges.

A side line of the training has been shopping trips for nails, glue, and other materials.

For adults the program has been different. Each student is allowed to select work of interest and necessity to him. Some are branching off into electrical repair and some are doing metalwork. Radios, flat irons, toasters, electrical clocks, and switch panels are among the items that have been taken apart and returned to running condition.

Mr. Hooker reports that, if anything, the nonsighted students are more careful in the operation of machines. "The danger of injury is practically zero, regardless of what you might think," he maintains. There have been no accidents. "The nonsighted concentrate on their work, work regularly and carefully, take no chances," says Mr. Hooker.

Miss Jennette Maris, teacher of the blind at Ann J. Kellogg school, is gratified that this is so since it bears out what she knew before. "The few available industrial statistics with regard to nonsighted workers prove that the danger of accidents is very small," she says.

Miss Maris, along with Mr. Hooker, hopes that when the day comes for the adult students to explore opportunities for full-time jobs, and the school students to secure part-time positions, that the generally "negative" attitude of employers can be changed to the point where they will readily agree to a trial for the skilled, nonsighted persons.

A blind adult learning how to operate a power saw

Employers are opposed to the moral risk of hiring nonsighted workers. All Miss Maris is asking for them is a chance. "Once hired, the nonsighted will prove their worth," she says confidently.

Discipline: Light Touch or Heavy Hand?

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Successful discipline is an attitude which produces a compelling desire for co-operation in students.

An ever recurrent problem faces teachers, both new and experienced, as they anticipate the new school year. This problem is classroom discipline. Teachers of industrial arts and vocational subjects begin with the advantage that students generally like shop subjects. This results in desirable pupil interest and strong motivation. It is a simple problem to sell the course because students already have a favorable attitude. However, the nature of the work sometimes lends itself to situations which can be more difficult than in traditional classrooms where students remain seated during a lecture or recitation period. Shopwork is dynamic and so are shop students! What methods shall the instructor use — a light touch or a heavy hand?

Surprisingly little help in discipline is given to undergraduate teachers who are about to encounter real shop situations. Graduate seminars presume that education at higher levels presupposes a mastery of the tools of method. Therefore the shop teacher often must rely on intrinsic ability, observation, and experience to develop his own philosophy of discipline. Some of his doubts and much of the necessity of "rediscovering America" can be avoided if he will analyze some of the factors of discipline; because problems of discipline arise from numerous factors.

Discipline Is Competency: A teacher who has mastered subject matter has a valuable start in student-teacher relations.

Students are quick to respect ability in an instructor who *knows his stuff*.

Discipline Is Preparation: The experienced teacher recognizes the value of well-planned lessons. Plans should include the use of specific job sheets, definite page and paragraph assignments, and adequate reference material. Careful preparation for demonstrations and use of visual aids will eliminate lapses in student attention. Busy students are seldom troublesome.

Discipline Is Organization: Dark toolrooms, remote or hidden finishing rooms, and any factor which removes students from the direct observation of the instructor, should be eliminated. If such obstacles exist, good management requires that they be removed, even if the finished product may be of somewhat lesser quality. No teacher can be sure of the conduct of students who are frequently out of sight or without supervision. Class organization is equally important in achieving student cooperation. Assignments, rotations, and the order of steps needed to acquire the skill which is being taught must be perfectly clear to everyone. We may *think* that we have explained clearly, but it is easy to overlook the fact that things which are obvious to us have never been experienced by many of our students. Multiple activity classes in particular need extra care in organization. A well-regulated system of shop foremen will help to care for numerous details of organization and can also be a device to effect constructive leadership.

Discipline Is a Sense of Humor: Situations which arise can be dismissed lightly or built up to the proportions of a major upheaval. Here a sense of humor may avoid a development which will require an unpleasant showdown. Frequently, when no offense is intended, the easier way is the better way. Then serious emphasis can be reserved for serious occasions.

Discipline Is a Friendly, Sympathetic Attitude: Nearly every student will respond favorably to a teacher who shows a personal interest in him. Criticism should always be constructive and should be done in a way which will improve student technique. Assisting those who have fallen behind or who have spoiled work should be done in the manner of lending a helping hand to one in difficulty. This helps to overcome a sense of failure and restores confidence. It can be a strong factor in creating an impelling desire for good discipline.

Discipline Is Fairness: There is no place in public school teaching for favoritism. Teachers naturally lean toward students who learn easily but should be vigilant to prevent a tendency toward special privileges. Teachers' *pets* are never popular and are resented by most students. Establishing fair treatment helps to establish respect.

Discipline Is Good Manners: Foreign visitors frequently criticize our students for failing to display what is generally agreed to be good manners. The easy familiarity assumed by many students certainly borders at times on bad taste. Only a skillful teacher can prevent this breezy attitude from creating disciplinary problems. A better way to command respect is for the teacher to establish firmly a proper relationship and to show every possible courtesy to students in shops, halls, and classrooms. They will quickly sense a teacher who commands respect and as quickly recognize one who cannot control undesirable familiarity. Teachers who tell off-color jokes and stories are guilty of one of the greatest breaches of good manners.

Discipline Is Patience and Flexibility: A teacher must overcome annoyance when interruptions occur and must be patient during the development of the learning process. A distinct emotional tone brings with it constant stress and strain. An air of interest which goes with a good disposition creates an atmosphere where disturbances seem out of place. Interruptions such as fire drills and special assemblies can never be fully controlled and must be accepted cheerfully.

Discipline Is the Desire to Teach: An enthusiastic teacher seldom has trouble with discipline. He has an eagerness and an interest which students wish to share. The desire to teach and the satisfactions rewarding successful teaching are personal equipment which are evident wherever teachers enjoy successful shop management. These prerequisites to good discipline cost nothing but are nonetheless invaluable equipment. Without them the teacher doesn't teach — he just keeps school.

Here are a few disciplinary "don'ts":

1. Don't fail to be at the door as a class enters.
2. Don't begin speaking to a class until you have their attention.
3. Don't allow shop classes to begin without first outlining the planned activities.
4. Don't excuse students from classes unless you verify the reason.
5. Don't send pupils to the principal or vocational director because of disciplinary problems which arise in your shop.
6. Don't remain seated at the front of a room during study periods or examinations. Move about quietly and spend some time at the rear of the class.
7. Don't fail to learn students' names as soon as possible.
8. Don't lose pupils through long sessions at a blackboard with your back turned.

Machine-shop class at Kenwood Evening Adult Education Center, Towson, Md. William Gold, instructor

9. Don't overemphasize theory and monopolize too much class time.

10. Don't forget that every child is a human being.

When Trouble Comes: If, in spite of all reasonable precautions, disciplinary trouble develops, have plans for settling the disturbance in a professional way. Corporal punishment is nearly always frowned upon and is seldom justified except in cases of downright impudence. Besides, severe cases of corporal punishment, although seemingly justified, often involve other persons and may reflect unfavorably on a school. Physical action may be justified to prevent immediate danger to a pupil as would occur if one were pushed into moving machinery or if a fight develops.

Usually, however, the better method is to order the guilty party to report after school. This removes him from an opportunity to create a self-centered scene and puts the student at a double disadvantage. If he fails to report, he has created an act of insubordination and is subject to being expelled. If he reports he can do little except acknowledge his guilt and agree to make amends to the teacher and to his fellow students. Unless he is a badly adjusted individual with a chronic record of trouble, he should rarely become a second offender.

By observing the factors of discipline and eliminating most of the causes of disciplinary action, serious problems should be very rare. Actually the serious problems never seem to arise when the teacher abandons the "heavy hand" in favor of the "light touch" in shop discipline.

From the standpoint of traffic *deaths*, the most dangerous single hour of the day or night during 1950 was from 6 to 7 p.m. The worst time for *injuries* was two hours earlier — from 4 to 5 p.m. Fifty-seven per cent of last year's *fatal* accidents occurred during hours of darkness; 42 per cent of 1950's *injury* accidents happened in the dark. — *The Travelers Insurance Co.*

The term, "naval stores," which has come to mean pine products such as rosin, turpentine, wood tar and pitch, dates back to the time of wooden sailing ships when the products were used to calk seams, treat rope, prepare paint, etc. — *National Lumber Manufacturers Association.*

Industrial Arts in Rural Education

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World War II centered our own attention on the lack of education in our own country because of the large amount of illiteracy found in our armed forces. Most of these individuals were from rural areas. Rural education has been a problem since the time of the industrial revolution. World War II only emphasized the problem in its inadequateness, its inequality of opportunity, its lack of trained teachers, and its failure to prepare rural people to meet the problems of our social, industrial world whether they migrate to the city or remain on the farm.

The primary duty of our public schools is to provide educational training for citizenship in a democracy. Democracy is not a birthright but a responsibility which demands intelligent and critical participation, both locally and nationally. This is essentially an industrial age; modern civilization is dependent largely upon science, invention, and skill. The manufacturing industries are important among the activities which make for the material well-being of the people. The interrelation of farm and city; agriculture, industry and labor; the dependence of any one group in American life upon the prosperity and well-being of all is an important ingredient of democratic education.

The war has caused our scientific, technical, and mechanical developments to outdistance our human ideals, social and cultural development so far that one of the great problems of democracy and the world today is to bring our social and aesthetic development up to the level of our technical progress before the latter destroys us. Again it is education that must bring us up to this level.

If we are lagging in our education to bring us up to this level why then is such stress placed on rural education? The answer is plain. The National Education Association reported that in 1946 more than 13,000,000 children were enrolled in rural schools. This was about half of the nation's total. Serving these pupils were 470,000 or 52 per cent of our nation's teachers. With so many individuals involved, the education of rural children is of enormous significance not only to the social and economic welfare of rural America but also to the entire nation. The nation draws much of its man power and renews its bloodstream from the country. The number of people needed in agriculture has decreased with the mechanization of farming. The birth rate in cities will not perpetuate their population. Hence the migration from farm to city.

The city is also dependent upon the farm for its food and fiber, as well as many other fundamental resources. The buying power of the farmer plays an important role in the national economy. It makes a difference whether farm people are good producers, have good incomes, maintain a good standard of living, or whether the opposite is true.

The increasing mobility of our population presents a challenge and problem that must be faced. With the continuous flow of population from rural to urban areas, the content as well as the amount of education provided by rural schools needs careful consideration. Many rural communities have lost their identity and many more will lose theirs soon as the result of improvements in our technical, mechanical world. Recreation for rural areas no longer centers in the schools and churches, but too often in the local taverns. Yet, rural schools remain largely unchanged,

a mute testimonial of lagging social adaptation. If these conditions are allowed to remain uncorrected, the fountain source of American democracy will run dry.

What are the conditions then that affect the rural school and are its problems? What steps can be taken to answer or solve them and correct the conditions?

Former U. S. Commissioner of Education, John W. Studebaker, in one of his reports to the White House Conference on Rural Education, stated that the major problems facing rural education were: (1) better teachers, (2) better school plants, (3) better and more adequate curriculums.

A number of rural districts have tried to get better teachers by offering better salaries, improved housing, and teacher security, and by making the teacher feel more a part of the community and giving him more of an opportunity to work and participate in community affairs.

The answer to the second problem seems to lie in combining and consolidating or redistricting school districts. Modern methods of transportation, improved roads, and better buses have made it possible to combine small and expensive districts into larger and more economical per capita districts serving larger areas and more pupils. This permits better buildings, better equipment, and better trained staffs. There is still a long way to go in this but quite a number of states have already taken the step and a number are in the process.

The third question is somewhat dependent on the first two being solved. It may be answered by asking what a curriculum is and how should the present one be improved? A curriculum has been defined as a series of integrated courses which will satisfy or achieve goals and objectives. The goal of general education is to develop happy, useful, successful citizens. To do this education must result in the growth of individuals in their ability to find satisfying solutions to persistent life problems. In general education there should be but one goal for general education for both rural and city life. Rural education must be equal to but not identical with urban education to meet the needs of rural life.

Again we might ask, is that what rural people want from education or is it something that is being prescribed for them because it is good for them? What kinds of educational opportunities do they want that will prepare their children for effective living whether it is in the city or in the country?

A few years back, Frank Cyr and Shirley Cooper of the Rural Service Department of the National Education Association conducted a series of eight conferences with rural representatives from forty states on "What farm leaders want schools to teach." They discovered that these leaders wanted nothing more than the objectives of general education could give them if general education became truly functional.

In summary these farm leaders felt the schools should:

1. Be a part rather than apart from community life.
2. Prepare children to think through and meet the everyday problems of life.
3. Make a strong rural America with equal health services, cultural advantages, recreational opportunities, income, housing and working conditions.
4. Help make a clean, healthful, wholesome community life that would use all the resources to best advantage and bring out the best in each person.
5. Help students to better understand the local community, its churches, schools, community organizations, youth organizations; its business, including its co-operatives, and its local government.
6. Be the center of broad educational programs which will give information, insight, and vision needed to cope with their problems.
7. Give information on marketing and industry through expanded adult education and new emphasis on elementary and secondary schools.
8. Develop the art of living together.
9. Provide for leisure time activities for youths and adults.
10. Give instruction in arts and crafts.
11. Provide opportunities for the enjoyment of cultural living with music, art, drama, and literature.
12. Give information and skills of industry so that rural people would not be at a disadvantage when migrating to the city.
13. Provide leadership for recreation.
14. Provide practical work experience.

These are surely in line with the objectives of all education. They could serve as worthy objectives of elementary, secondary, and adult education in any area, agricultural or not. Perhaps many of them are already being attained in elementary and rural high schools. The records show however, that we are a long way from realizing most of them.

Most of the books, articles, and conferences on rural education and its problems agree that these problems involve the lack of teachers, buildings, and a functional curriculum that would prepare rural people for living. As a solution all have emphasized the "three R's" as being able to satisfy the needs in one form or another. All have overlooked the importance of the "three M's," machines, materials, and manipulative processes in our present industrial world. They have also overlooked the phase of general education that deals with the three M's — industrial arts.

As a phase of general education it offers a more effective and economical means of realizing the objectives than any other subject. There is a present tendency, perhaps because of the federal support involved, to establish vocational agriculture in the secondary schools. This has been a need for a long time but is only the answer for those people making agriculture their lifework. Industrial arts answers the needs of the large number of people that terminate their education at the elementary or secondary school level as well as for additional adult education. It can supply what the rural leaders want.

Industrial arts is that phase of general education that is concerned with the machines and materials of manufacture, the manipulative processes and the contributions of those engaged in the production, use, and consumption of goods. The learning comes through the pupil's experiences, interpretations with tools and materials, and through his study of resultant conditions of life.

The objectives of industrial arts: interest in industry, appreciation and use, self-discipline and initiative, co-operative attitudes, health and safety, interest in achievement, orderly performance, drawing and design and shop skills and knowledge, have general values that apply at all levels. In a continuous program for elementary and secondary schools these values would be progressively intensive and cumulative in their effect as the pupil advances in maturity.

Industrial arts is largely manipulative in character, yet it affords much content that is informative, technical, as well as social; thus contributing to complete living because it meets needs that are real and satisfies impulses that are inherent. For rural education it contributes in a unique and wholesome way to social awareness and morale by its opportunities for experimentation, leading to discussion, observation, and further reading. This in turn gives participation in activities which permit discovery and development of creative and artistic abilities. The work is appropriate for boys and girls alike and

its leisure time possibilities, and recreational interest extend over into adulthood. Outside the schools, industrial-arts subjects or activities can be pursued for avocational as well as recreational or occupational values. In school and out, city school or rural school, regardless of ages and interests, industrial arts makes a contribution to creative thinking and doing, intellectual development, social orientation, and economic and industrial adjustment. It could be America's forgotten opportunity for realizing its objective of equal opportunities for all and especially in education.

It is still true that education is the hope of our youth, youth is the hope of our democracy, and our democracy is the hope of the world. We should therefore make that education the best there is for *all* of our American youth.

Elementary Industrial Arts in the Public Schools of Tulsa, Okla.

M. J. RULEY
Director, Industrial Arts and Vocational Education
Tulsa Public Schools
Tulsa, Okla.

The elementary school industrial-arts program in Tulsa is composed of crafts work, and begins in the kindergarten, continuing through the sixth grade. At the present time this program is in operation in only eight of our schools, but new programs are being established as soon as space can be made available for them.

The program varies in each of the schools but, without exception, it is conducted in a crafts shop by a specialized teacher. In the lower grades, only the most elementary projects are made. Students are taught the use of tools, including the saw, hammer, file, try square, brace and bits, ruler, etc. In the upper grades, activity is continued and expanded to include the use of very specialized tools; the work undertaken is kept within the ability of the pupil. The whole program is one of gradual development in skill and knowledge.

In offering elementary industrial-arts crafts work, it helps the children to develop confidence in their ability to make useful things with their hands. It teaches the functions, limitations, and care of tools, materials, and the value of safety measures. It offers an opportunity for release of tension and improvement of muscular coordination. It encourages the children to plan and organize their own projects, and they become more accurate and precise. An experimental attitude is encouraged in the use of materials and they are given opportunities in creative activities for releasing the physical and emotional tensions.

There is a growing ability to express their ideas intelligently. The fact that children are actually able to make articles, creates within them a consciousness that it is possible to accomplish something. We want to develop dependability, self-control, and willingness to co-operate with one another. We want to develop an appreciation and understanding in the use of leisure time, which is one of the most important points of all. In the machine age in which we live a program of crafts from the standpoint of the use of leisure time alone is justified. Here a child puts into practice every bit of knowledge that he has, the best that is in him, and is happy while doing so. When a child's hands are busy, the whole child is occupied.

In the elementary industrial-arts crafts program, the following areas are covered: woodwork, paper, tapping, block printing, weaving, clay modeling, feltwork, leatherwork, plastics, glass etching, wood carving, and others.

During the summer a group of industrial-arts crafts teachers meet in a workshop for two weeks to develop a guide for new teachers of crafts work in the elementary schools, and to standardize somewhat the offerings so that students will receive effective training regardless of the schools they attend; also to describe the purpose and content of the elementary industrial-arts course, to those interested.

The results of these workshops are then made available for use in all of the schools. The principals and students of the schools where industrial-arts crafts are offered, are very complimentary, and with the elementary industrial arts as a base we are expecting a much better program in the junior and senior high schools of Tulsa.

Crafts work in the lower grade

Industrial Arts and Vocational Education

John J. Metz, *Editor*

EMPHASIZING SHOP SAFETY

In the June, 1951, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION there is an editorial titled "Safety Hints for Vacationers." It is based on the idea that the young, when on their own, may be expected to do many things without first thinking through to the end results of their actions.

To many youngsters, the school shop is an entirely new experience. Many of the things he will do will be quite strange to him. Many of them are fraught with dangers, and these dangers are worse because the new student does not recognize them as dangers. He is not on the lookout for them; hence, when he comes upon them suddenly, he is entirely unprepared to avoid them and thus save himself.

What is still more appalling is that the student may probably have but one chance to make the decision of what is the right thing to do when danger arises. With this picture in mind, it is easy enough for the shop teacher to recognize the great importance of teaching safety, and the need of starting safety instruction at the very earliest moment and to carry it through from the first day of school to its very end.

The thing to do then is not only to demonstrate how to use a tool, but also how to use it safely.

This is by no means an easy task. The teacher may have learned how to avoid accidents in using tools and performing the various operations so that he is hardly cognizant of the things he does to perform his operations safely. He practices safety without thinking about it. The problem is, how can he pass his safety practices and habits over to his students?

No doubt he has thoroughly analyzed the various tool operations from the operational side. He must now concentrate on making a similar analysis of the dangers that are hidden in the use of these tools when working with them on various kinds of material.

This is a very difficult task, since tools also can be dangerous when they are not in use. Accidents may happen just because a sharp-edged tool has not been laid down or hung away properly. The safety analysis, therefore, has to be made in a very thorough and painstaking manner.

Have you such an analysis? Would it not be well to have one ready when school opens? There is still time. If the work is done now you may avoid some very bad moments for yourself and some of your students later on.

STEEL SCRAP

During World Wars I and II, the country was alerted again and again because the supply of steel scrap ran very low. Now, with World War III in the offing, we are in the same predicament again.

Shop teachers, who understand about industrial problems, can readily see why scrap shortages must be avoided at all costs. While at the present time, no effort is made to start a household scrap drive like the one conducted during the last war, nevertheless the steel industry is striving strenuously to enlarge its scrap inventory as much as possible.

Steel production in 1950 was 96,700,000 tons, according to the American Iron and Steel Institute. During the first quarter of 1951, the annual rate of steel production rose to 104,000,000 tons. It is expected that by the end of 1951, 107,000,000 tons will have been produced.

These increases of steel production naturally mean further increases of iron and scrap. In 1950, 29,500,000 tons of purchased scrap were used. The estimated requirements for 1951 will be approximately 32,500,000; and for 1952, 35,500,000 may be needed.

Steel production in other countries also is on the increase, and they will need scrap also. The United States imported 760,631 tons of it in 1950, but we cannot expect too much from these foreign sources. If the 117,000,000 tons of steel which we shipped abroad during World War II remained in this country, much of it would now furnish the scrap we need.

As has already been remarked, at present we are not asked to conduct a household scrap drive, but the school can help industry in quite a material manner. While the school shop may not be a source of large quantities of scrap metal, nevertheless, if we consider the large number of schools in the United States, it might not be far wrong to say that each school shop could furnish at least fifty pounds of scrap. Considering then that there are approximately 27,000 school shops in which aviation mechanics, auto mechanics, electricity, farm shop, machine shop, metalworking, and welding are taught, it would mean an additional 1,350,000 pounds of scrap. This may not represent a huge quantity in the manner in which the steel industry appraises quantities, yet it is not to be sneered at, and it would help reduce present shortages somewhat.

Furthermore, it would demonstrate again that the schools are ever ready to assist worthy undertakings in every way. It would also have a good effect on the students who might be asked to help collect this scrap.

"But," might be asked, "where would you look for scrap in the school?" Just ask your janitor. No doubt he will be able to show you dark nooks in the school basement where metal parts of discarded and broken seats, old automobile parts and engines, faucets, water pipes, etc., are piled up. Sell this material to collectors of scrap metal who in turn will sell it to the steel industry, thus helping in no mean way to do away with the shortage of steel scrap about which one hears so much nowadays.

AUTOMOBILE ACCIDENTS AND WAR

The Association of Casualty and Surety Companies has made a study of fatalities due to wars and automobile accidents which carries some very significant pointers for the school.

Approximately 12,000 combat deaths have occurred among United States forces in Korea since hostilities started on June 25, 1950. On the eve of the war's first anniversary the Association's accident prevention department estimated that the nation's traffic dead during the same 12-month period totals about 36,050—three times the U. S. death toll in Korean battles.

Do these statistics mean something to you as a teacher of industrial arts and vocational education?

Is there a safe driving course taught at your school? If not, can you do something about it?

Construction of the model house

Vocational Education and the Prisoner

CARL C. WOUGHTER
Institutional Vocational Instructor
Attica State Prison
Attica, N. Y.

Vocational education in the nation's prisons, and in the prisons of New York State in particular, is, in the matter of years, a fairly recent development.

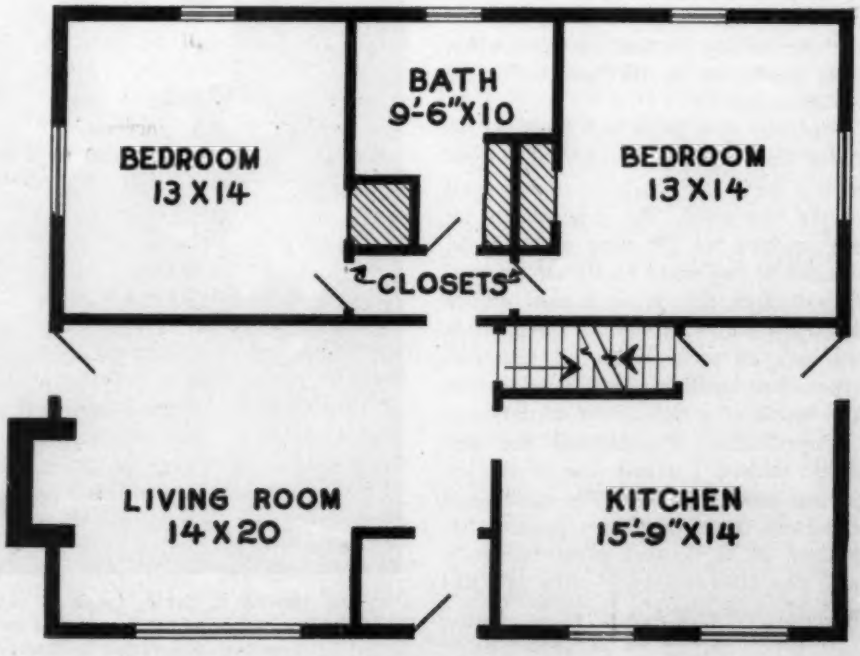
The N. Y. Department of Correction's magazine *Correction* recently pointed out that the earliest reference to anything in the penal system which could even remotely be called education is found in the laws of 1822 stating that, ". . . It shall be lawful . . . to furnish a Bible for each prisoner confined in a solitary cell. . . ." By 1829 this *privilege* was extended to all inmates.

From there on education of prisoners was a laboriously slow process. All matter of problems were involved. Eventually the teaching of academic subjects became a general part of the rehabilitation program, but vocational training as such, oddly, did not really get under way until 1925, at which time instructors were required to have teaching certificates, or parallel training as a journeyman printer, machinist, etc.

It has long been a known fact that 90 per cent of the inmates of prisons are men who have worked with their hands. In the majority of cases these men have never had proper vocational trade training. To equip the prisons with necessary machines, tools, equipment, and related training paraphernalia was no easy task.

Principal of the arguments against training in trades, of course, was the inherent fear that given tools prisoners would immediately scheme ways to fashion keys to unlock prison doors, build collapsible ladders — or even make homemade guns. This argument of the prison custodial forces was fundamentally logical, but it was quickly shown that prisoners anxious to learn to be a machinist, automobile mechanic, carpenter, etc., were their own best police. They realized that their future as a skilled worker lay in their protecting the privilege of being given the vocational training they wanted and needed.

Seldom does a prison have a sufficiently large budget to allocate large sums of money for the purchase of lathes, saws,



Layout of model house

drills, printing presses, automotive units, etc. So that, too, was a problem. But not for long.

Industry, private industry, often responded to solicitations from inmates for equipment. Soon thereafter the importance of vocational training in putting prisoners back into society as constructive rather than destructive individuals was recognized. More funds became available, and with them improved equipment was obtained, and better teachers were attracted.

Men in prison do want to work with their hands. It isn't just to kill time. They want to create, and to do something with their hands to fill a long empty gap in their lives. During the war thousands of exconvicts were employed usefully and gainfully in war industries. The skills they acquired in prison vocational school were of value to their country — and to themselves as citizens.

Now another war is in the offing. Private industry is gearing its operations to the now familiar tempo: war production. Once again prisons are able to parole skilled workmen into industry. Private industry is again co-operating in giving these men a chance to exercise the skills they acquired in prison vocational classes.

Here at Attica State Prison, which is one of New York's most advanced maximum security prisons, vocational training is devoted to machine shop work, job press operation, carpentry, and automotive mechanics. Our equipment is not the best but our training methods are those which have proved to be the best under the circumstances.

Basically there is no real difference between our teaching methods and those carried out in the vocational-trade schools of the free world. The requirements for our teachers are the same as those demanded of free world vocational teachers. Our students, though, are a more diverse set. They are not a selective group. Here we have all social levels, all races, all types of personalities. Most have not had the benefit of a high school education.

Co-ordination of vocational and academic subjects has been one of the important procedures here. The wedding of classroom theory and shop practice has enabled us to develop latent talents in men who, otherwise, would never have had a chance to master a trade.

Co-operating with the vocational school is the institutional psychologist who administers aptitude tests which do much to help place inmates in the proper classes.

Always, of course, the individual's desires are listened to. If he wants to become a machinist he is given the opportunity. Frequently we have a man in the machine shop who very evidently would prefer to be a printer. The switch is made.

Best example of proper classification of the individual prisoner, and of a typical Attica State Prison vocational-training project, is the story that lies behind the model house we exhibited at the New York State Fair at Syracuse in September of the past year.

About two years ago a man enrolled in the automotive class was noted to be continually hacking away at a piece of wood, making picture frames, tiny boxes, and other improvisations out of whatever scraps of wood he was able to get his hands on. He had no previous training in working with wood.

After talking with this man he was transferred to the carpentry class. On his promise to study construction details and all phases of carpentry, he was made inmate instructor in the woodworking shop.

In a very short time he had integrated the carpentry class work into carefully detailed projects.

Fired with interest and determined to make good, he studied nights in his cell. Every book he could get his hands on which pertained to carpentry and allied subjects was studied by him. Now with his help students actually build houses down to the last minute detail.

Here is how they built the house which illustrates this article:

A course to illustrate theory and actual house framing and building was taught, and only after that course was completed were several model houses built.

These houses were built on a scale of one inch equals one foot (one-twelfth actual size). The different styled homes were left in various stages of completion to emphasize step-by-step procedure.

The only parts in the entire construction not actually nailed together are the tiny sash bars in the windows and the finished hardwood floors. These had to be glued together, since nails small enough were not to be had.

The double-hung windows open, and the doors have tiny metal hinges and doorknobs which were fashioned by the students.

Dr. Harold C. Hunt, general superintendent of schools, Chicago, Ill., presents ribbons to the district and city-wide winners of the birdhouse contest. Submitted by Louis V. Newkirk, director, division of industrial arts

Sheathing is nailed diagonally for added strength, and the siding is beveled and matched at the corners of the house — no corner boards being used. On the back of the house shown at the State Fair several cross sections were left open to illustrate joist, studding, sheathing, and rafter details.

One of the things which attracted particular attention at the Fair was the detailed construction of the roof and how it is shingled. These tiny shingles were made to scale and fashioned of emery cloth stained the variegated color of composition shingles.

As a final gesture of reality the students laid a fireplace of plaster of Paris and stones complete with flue opening.

Since this project was inaugurated, teaching is simplified by ready reference to these models. The illustrations amply testify to the efficiency of the method, and the interest of the inmates in a project aimed at helping them to acquire a trade and thus pave the way for them to reenter society as useful citizens.

The same can be said of all our vocational training projects. Whether it's carpentry, machine shop work, printing, or automotive mechanics, the emphasis is on practical work co-ordinated with theory.

Each year forest fires in the United States, most of them man caused, destroy enough wood to build 86 thousand homes. — *National Lumber Mfg. Assn.*

PROBLEMS AND PROJECTS

PRODUCTION ILLUSTRATION IN HIGH SCHOOL

A. M. YOUNGQUIST
Morrison R. Waite High School
Toledo, Ohio

Production illustration is the name given to pictorial drawings used in speeding up production in industry. Three-dimensional illustrations have always been used to some extent in engineering, but it was only during World War II that production illustrations in this country came into extensive use as a means of expediting production. Adequate and economical production by unskilled, or at best semi-skilled workers, was a serious bottleneck during the war. The use of production illustrations is largely credited with solving this difficulty in many plants, and their use in industry and engineering is here to stay. The aircraft and shipbuilding industries, as well as the various U. S. ordnance departments, found them tremendously useful and were the first to establish subdivisions in their engineering departments for making these illustrations. Other industries soon followed suit and to meet the demand for trained illustrators, classes were offered in universities and colleges. Engineering, science, and management war training, sponsored by the United States government, opened night classes in production illustration wherever the need was greatest.

In some industries the departments devoted to production illustration call their men graphic engineers. This name seems very appropriate as it indicates the approach to making illustrations by engineers as well as by the artists which embody mechanical accuracy as well as art in rendering.

Of the two, the trained engineering mind is the more important, as the illustrator in industry must have technical knowledge; he must know how to read and interpret orthographic drawings; and he must know how the machine works. Satisfactory techniques in rendering can be easily acquired, especially where commercial mediums for shading, such as Craftint paper, are used. Sometimes engineers make accurate scale perspectives and artists are employed for the rendering only.

For a long time many industries, such as the automotive industry, used principally retouched photographs for servicing and maintenance illustrations. This method is slow and expensive and has many inherent difficulties such as poor perspective, objectionable shadows and inaccessible places for camera work. Rendered perspective drawings, on the other hand, can readily be made to show clearly any part of the machine; assembled, in sections, exploded, or phantom views of the interior.

Production illustrations can never replace conventional engineering drawings, but they are a valuable supplementary means of conveying information, particularly in large-scale production line operations. The list of firms using production illustrations is impressive, and the number of engineering colleges which offer courses in production illustration is likewise impressive. In this age of specialization it is not improbable that engineering schools will offer degrees in graphic engineering — possibly combined with industrial design.

During the war the writer taught production illustration in the E.S.M.W.T. program and since then he has taught it in regularly accredited university classes. Interest in the subject led to rather extensive introduction of pictorial drawing in the regular industrial-arts mechanical drawing classes at M. R. Waite High School, Toledo, Ohio, with very gratifying results.

Pictorial drawing has always been presented, to a limited extent, in high school drawing — that is, very few isometric, oblique, and perspective drawings are made illustrating principles, but rarely is pictorial drawing carried far enough to master thoroughly the principles or to develop any kind of illustration technique or to explain the many uses of illustrations in industry.

There is a natural resistance among drawing teachers and engineers to give much training or emphasis to illustration drawings because their extensive use is comparatively recent and all the emphasis has been placed on orthographic engineering drawings. In other words, "It has never been done before." Professional engineers forget that traditional prints are likely to be extremely confusing except to specially trained men. This difficulty in interpreting orthographic drawings quickly and correctly is common not only to assembly line workers but also to patternmakers, shopmen of all kinds, management, sales force, buyers, and all down the line. However, this resistance to the use of production illustrations is rapidly being overcome as the needs of industry and the many uses for illustrations, with their resulting economy, are more fully recognized.

It should be noted that illustrations are used for a great many time and error saving purposes other than on actual production or assembly lines. The uses and application of pictorial drawings in industry, as outlined for students, follow:

Uses of Pictorial Drawing in Industry — in Plant

1. *Design:* (*a*) aids in preliminary studies and development work; (*b*) co-ordinates and speeds up assignment of work; (*c*) aids production of mockups.

2. *Planning* — Saves time and lends itself

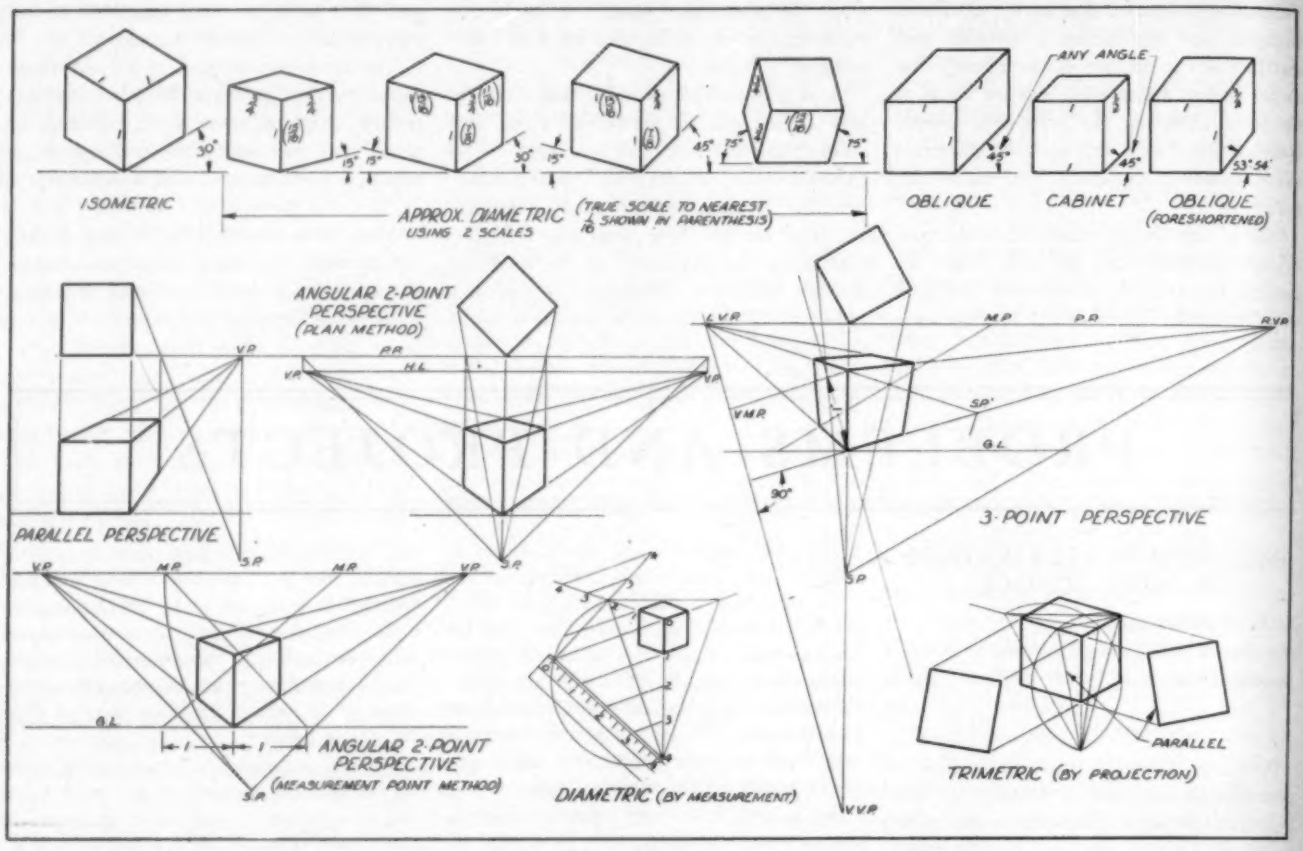


Fig. 1. Fundamental principles of the common types of pictorial drawing

well to planning: (*a*) master breakdown assembly showing work area units; (*b*) planning for tooling; (*c*) planning for materials and equipment; (*d*) planning assembly line.

3. *Instructions*—Makes for clarity and time saving in: (*a*) educational movies, and safety illustrations; (*b*) instructions for machine operators (important use). "A good picture is worth a thousand words."

4. *Details*—Aids in identification and interpretation of drawings of: (*a*) structural and stock materials; (*b*) forgings and castings.

5. *Assemblies*—Expedites work and reduces error in: (*a*) bench assemblies; (*b*) production units or subassemblies (stacks or exploded views); (*c*) functional assemblies (controls, wiring, and piping diagrams); (*d*) assembly sequence and complete assembly views.

Uses Outside of Plant

1. Assembly charts if shipped knocked down.

2. Service, maintenance, and repair charts (a large field in military ordnance and for machines of all kinds).

3. Advertising, catalogues, and sales.

4. Saves time in correct interpretation of designs to outside vendors, subcontractors, and manufacturers.

Other Uses

1. Architecture and city planning.

2. Patent drawings and educational films and slides.

3. Illustrations for textbooks, magazines, and reports.

4. A very useful *teaching aid* for mechanical drafting. (Many problems difficult of interpretation by students are easily cleared up by use of a graphic illustration, thus saving teacher's time.)

The foregoing outline is explained more fully by the instructor. Another mimeographed sheet of general instructions for illustrators based on industrial practice, is given to students in the following form:

Instructions to Illustrators

Production illustrations for assembly or subassembly purposes should be accompanied by complete instructions either on the drawing itself or on a separate printed job instruction sheet. The job sheet or the instructions on the drawing will include:

Job Name..... Job No.....
Location..... Worktime.....
Inspection requirements .....
Steps (Procedure of work) (1).....
(2)..... (3)..... (4).....
Hand Tools Required: (1).....
(2)..... (3).....
Company Tools Required: (1).....
(2)..... (3).....
Part Number (Identification).....
Part Name.....
Number Required.....

Reference to detail drawings of parts also may be made.

Reference to other area drawings may be useful.

Without encroaching too much on the time usually devoted to training in engineering drawing, high school students may be given a rather thorough groundwork in the theory and practice of making production illustrations, and they frequently develop technique in rendering that is surprising. Students usually enjoy making mechanical perspectives and shading them realistically. Student examples of shaded perspectives are shown in Figures 5, 6, 7, and 8.

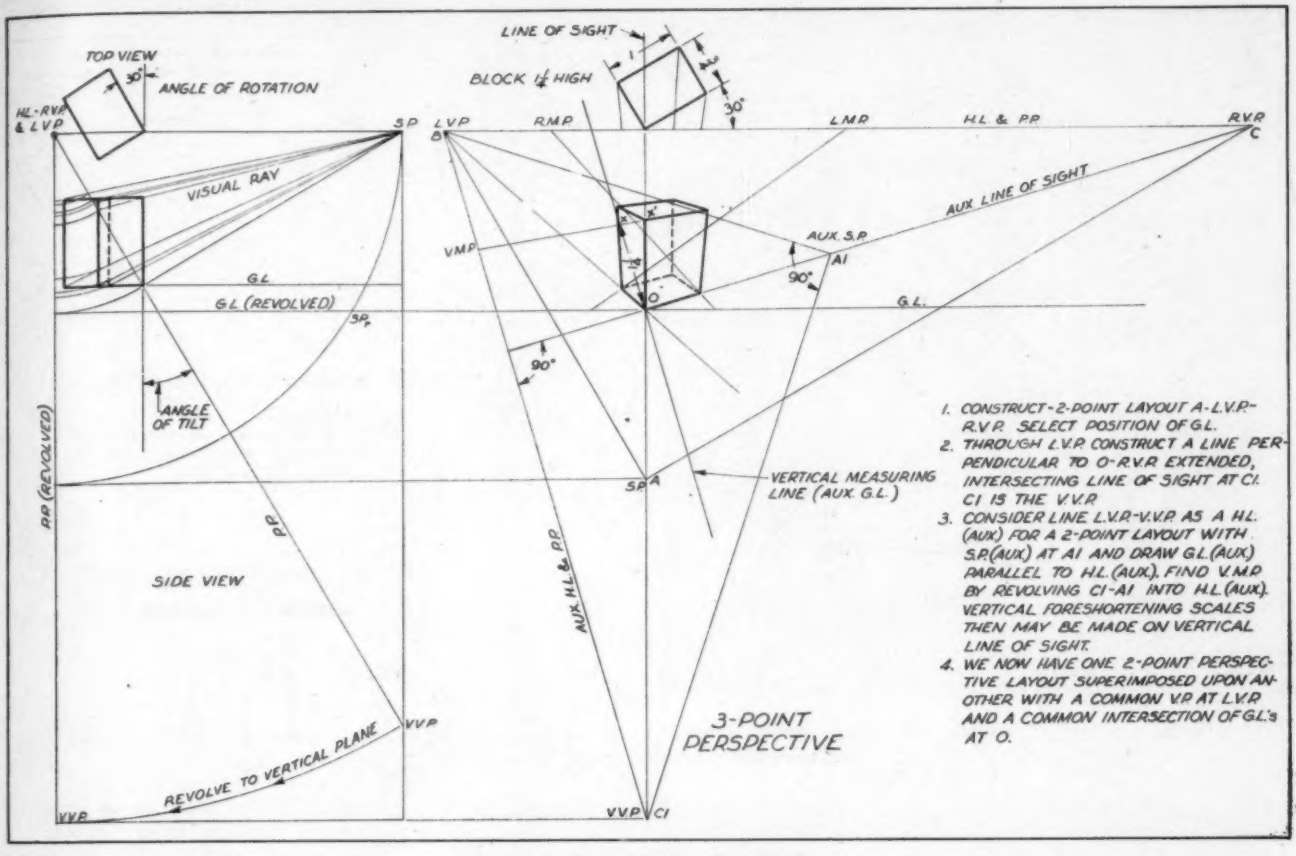

TOP VIEW
ANGLE OF ROTATION
HL-RVP & LVP
SP
VISUAL RAY
GL
GL (REVOLVED)
SP
ANGLE OF TILT
PP (REVOLVED)
PP
SIDE VIEW
REVOLVE TO VERTICAL PLANE
VVP
VVP
LINE OF SIGHT
BLOCK 1½ HIGH
LVP
RMP
LMP
H.L. & PP
RVP
AUX LINE OF SIGHT
AUX. S.P.
VMP
A1
90°
G.L.
90°
VERTICAL MEASURING LINE (AUX. G.L.)
SP
AUX. H.L. & PP
VVP
C1
3-POINT PERSPECTIVE
1. CONSTRUCT 2-POINT LAYOUT A-L.V.P.-R.V.P. SELECT POSITION OF G.L.
2. THROUGH L.V.P. CONSTRUCT A LINE PERPENDICULAR TO O-R.V.P. EXTENDED, INTERSECTING LINE OF SIGHT AT C1. C1 IS THE V.V.P.
3. CONSIDER LINE L.V.P.-V.V.P. AS A H.L. (AUX.) FOR A 2-POINT LAYOUT WITH S.P.(AUX.) AT A1 AND DRAW G.L.(AUX.) PARALLEL TO H.L.(AUX.). FIND V.M.P. BY REVOLVING C1-A1 INTO H.L.(AUX.). VERTICAL FORESHORTENING SCALES THEN MAY BE MADE ON VERTICAL LINE OF SIGHT.
4. WE NOW HAVE ONE 2-POINT PERSPECTIVE LAYOUT SUPERIMPOSED UPON ANOTHER WITH A COMMON V.P. AT L.V.P. AND A COMMON INTERSECTION OF G.L.'s AT O.

Fig. 2. Three-point perspective

The fundamental principles of the common types of pictorial drawings as applied to a 1-in. cube are shown in Figure 1. Illustrations of complicated parts, curved surfaces, etc., are not easy to make, therefore a series of five to ten problems of each type, progressively more difficult, must be made before the student can successfully make illustrations with any degree of speed and assurance. A typical course outline follows:

Production Illustration — Problem Outline

Isometric: (1) block, (2) motor bracket, (3) coil spring, (4) clutch, (5) sketching.

Oblique: (1) bracket, (2) bolt and nut, and coupling (in ¼ section), (3) helical gears, (4) roller bearing (exploded), (5) sketching.

Dimetric:

Trimetric: (1) and (2) angle block exercises, (3) spindle bearing (exploded), (4) loose pulley (with ¼ section removed).

Perspective — plan method — one point parallel — two point angular: (1) 3 exercises, (2) cylinder, (3) link, (4) airplane nose (double curved surface).

Perspective — Measuring point method: (1) 3 exercise problems, (2) cylinder and block (parallel), (3) cylinder and block (shadows, 3), (4) block and plane with shadow, (5) house with shadow (perspective plan), (6) box with cover open 30° and 60°, (7)–(10) engineering problems (details-assemblies, exploded views or stacks).

Perspective — Three Point: (1) exercise block, (2) monument, (3) modern office building with offsets (details omitted), (4)–(10) machine parts and assemblies (varied to suit).

Sketching.

(NOTE: Outline varied to suit special needs.)

Considerable attention is now being given to the new methods in making axonometric (dimetric and trimetric) projections for pictorial drawings. Trimetric drawings are flexible and generally make more interesting and realistic pictorials than isometric or oblique. Our course gives considerable training in making trimetrics, sufficient at least to enable students to understand the principles and their applications to illustrations. We have found, however, that we can make perspectives more quickly. Perspectives are made from measurements and do not require orthographic views to project from as trimetric projections ordinarily do.

Speed is, of course, desired and there are numerous short cuts and devices to aid the illustrator as, for example, the use of the cutout perspective board for three-point perspective shown in Figure 3. On such a board the special T square, riding on three arcs, is always in line with the vanishing points which are far enough away to make a good picture. The station point can be several feet from the picture plane, and vanishing points five or six feet apart. (On a standard 24 by 36-in. board, the station point can be only about 10 in. from the picture plane for 30-deg. by 60-deg. three-point perspective if the vanishing points are to be on the board. Such a close-up view of an object makes what is sometimes called "violent perspective" and is not realistic or pleasing in appearance.)

The cutout perspective board with foreshortening scales reproduced thereon is patented and may be purchased for $75. Since this price is out of the reach of the average student we make a cutout board without foreshortening scales thereon. (The use of cutout arcs in perspective is not patentable.)

Figure 4 shows how to mount rollers on a standard T-square head for riding on the perspective board arcs. Such a mounting on the T square eliminates a special T square and does not interfere with its use for regular drawing purposes. Two assumed foreshortening scales for the three vanishing points are used.

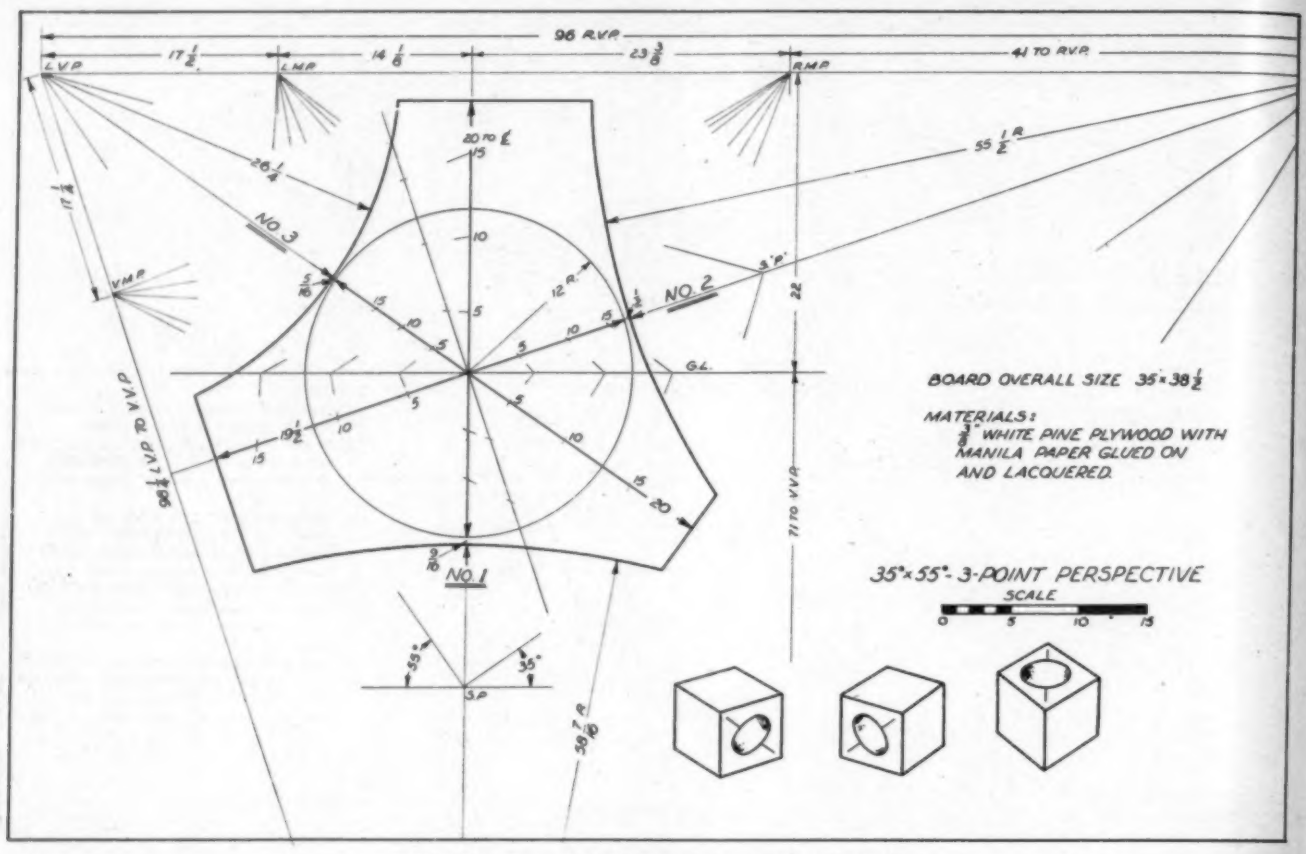


Fig. 3. Use of the cutout perspective board

These scales are glued to the T square as shown in Figure 4. The zero point on the scales must be at the intersection of the ground line and center of vision as located on the board, and the arcs cut accordingly. Figure 2 shows how this is done.

The board may be used with the vertical form from either position No. 1, 2, or 3, Figure 3. Position No. 1 is used where the right side of the object to be drawn presents the most important details to be shown; position No. 2 where the left side is more important; and No. 3 where more of the top should be shown. In Figure 1 may be seen the relative angles of rotation and tilt of a cube in perspective made from positions 1, 2, and 3.

The cutout perspective boards are great time savers. Students lay out and make their own boards out of ¼ or ⅜-in. white pine plywood. A 35 by 55-deg. three-point layout, with a 24-in. working circle was found to be the best for all-round purposes. A good grade of Manila paper is glued to the working surface of the board. The paper is then sprayed with thinned clear lacquer to preserve the surface. White, buff, or cream colored battleship linoleum cemented to the board also makes an excellent working surface. The linoleum should be waxed occasionally.

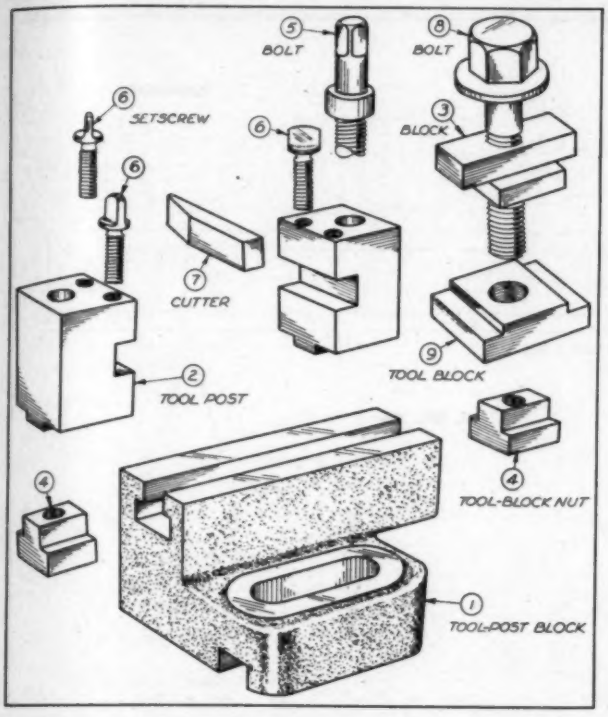
Students take great pride in their boards, enjoy using them, and turn out very realistic illustrations. However, before they are turned loose on the boards they make a smaller scale 3-point layout so that they understand the theory and principles involved in 3-point perspective, and can make a layout for any given angle.

As all circles and arcs in perspective become approximate ellipses or part of an ellipse, the use of cutout ellipse templates are tremendous time savers in making production illustrations. It is possible now to purchase ellipse templates for this purpose for every five degrees from 15 to 60 deg., and in diameters increasing by ⅛ in. from ⅛ to 4 in. There are 20 sheets in the set. One or two sets are sufficient for a class. The ellipse angle guide, shown in Figure 4, indicating approximate locations where each template sheet is used on the three vanishing directions, is helpful and saves time in selecting the template sheet of proper degree.

Freehand pictorial sketching, the artist's approach, has a place, particularly for small parts drawn separately, and usually drawn from the actual piece. An illustration is often needed however, before the part has been made, and more complicated parts and assemblies require a true picture — that is, a mechanical perspective which maintains *scale accuracy*, showing true contours, clearances, etc. Hence, the production illustrator must master mechanical perspective and at the same time avail himself of short cuts to save time. Often, the principal features and over-all proportions are made mechanically true and smaller details such as bolts, nuts, etc., can be estimated as to size and sketched in freehand.

The everyday shop problems and procedures must also be understood by the qualified illustrator. It can be seen, then, that the training for the production illustrator is first and foremost that of an engineer. The art side, shading or other rendering, is secondary, but nevertheless important, for finished drawings. High school students tend to overdo the shading but that is not serious at this stage of their training. They soon develop acceptable and in many cases outstanding art techniques.

Students first practice with line shading, the simplest form of shading. See Figure 5. It reproduces well on blueprints and is very effective for shop drawings. Smudge shading is also used extensively in classwork, as it is easy to do and makes attractive drawings. Smudge shading is a simple and inexpensive



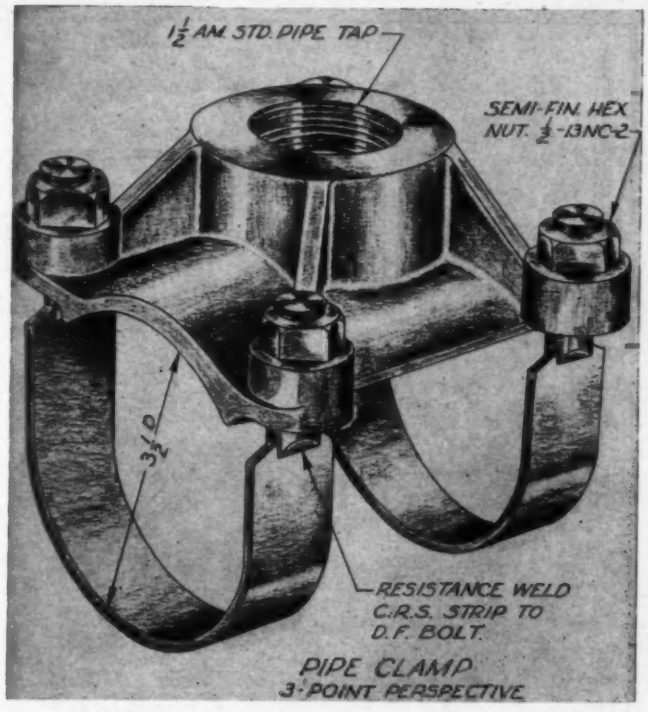


Fig. 5. (Left) Exploded view, 3-pt. perspective, pen and ink stippling and line shading. Fig. 6. (Right) Pencil shaded production illustration

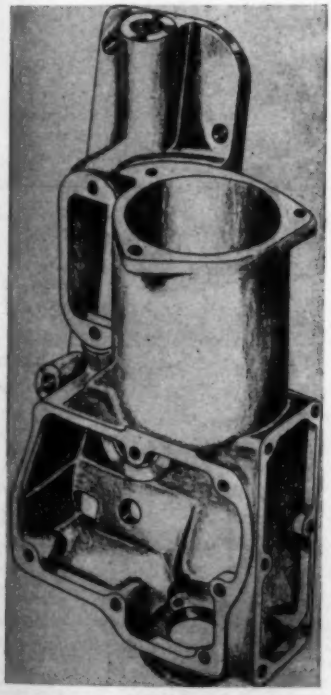


Fig. 7. Pencil shaded production illustration

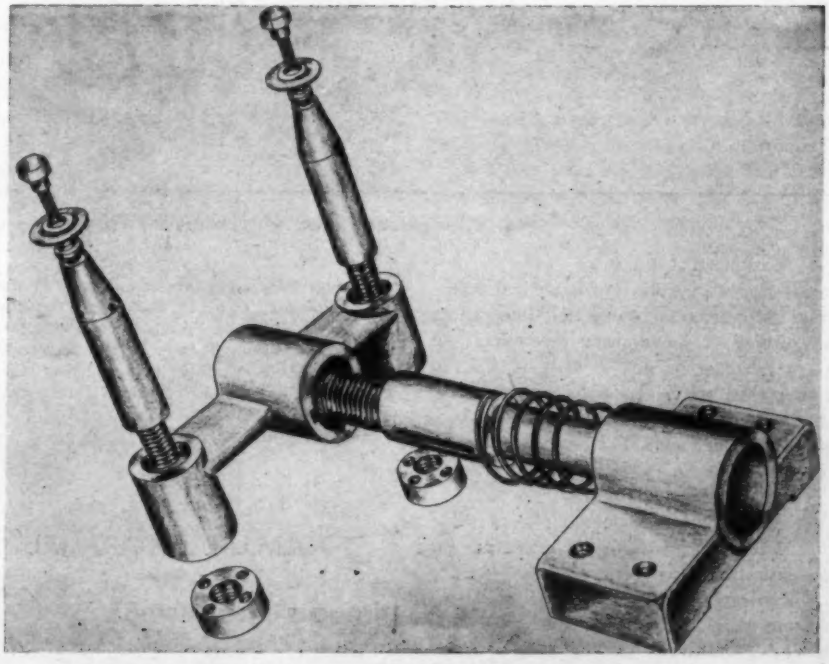


Fig. 8. Pencil shaded exploded drawing

medium for learning values of tone and acquiring techniques is preparation for airbrush rendering later on. Airbrush rendering requires considerable practice and skill, and the equipment, which includes cutout stencils, air compressor and airbrush, is rather expensive. Generally, there is not time enough for students to acquire any real skill in airbrush rendering. However, its use is demonstrated and the students have an opportunity to try it out on one or two drawings. The airbrush gives a very finished drawing, but has the disadvantage of requiring a half tone for reproduction. The use of Craftint doubletone paper as a medium of rendering is also demonstrated. It is somewhat expensive for

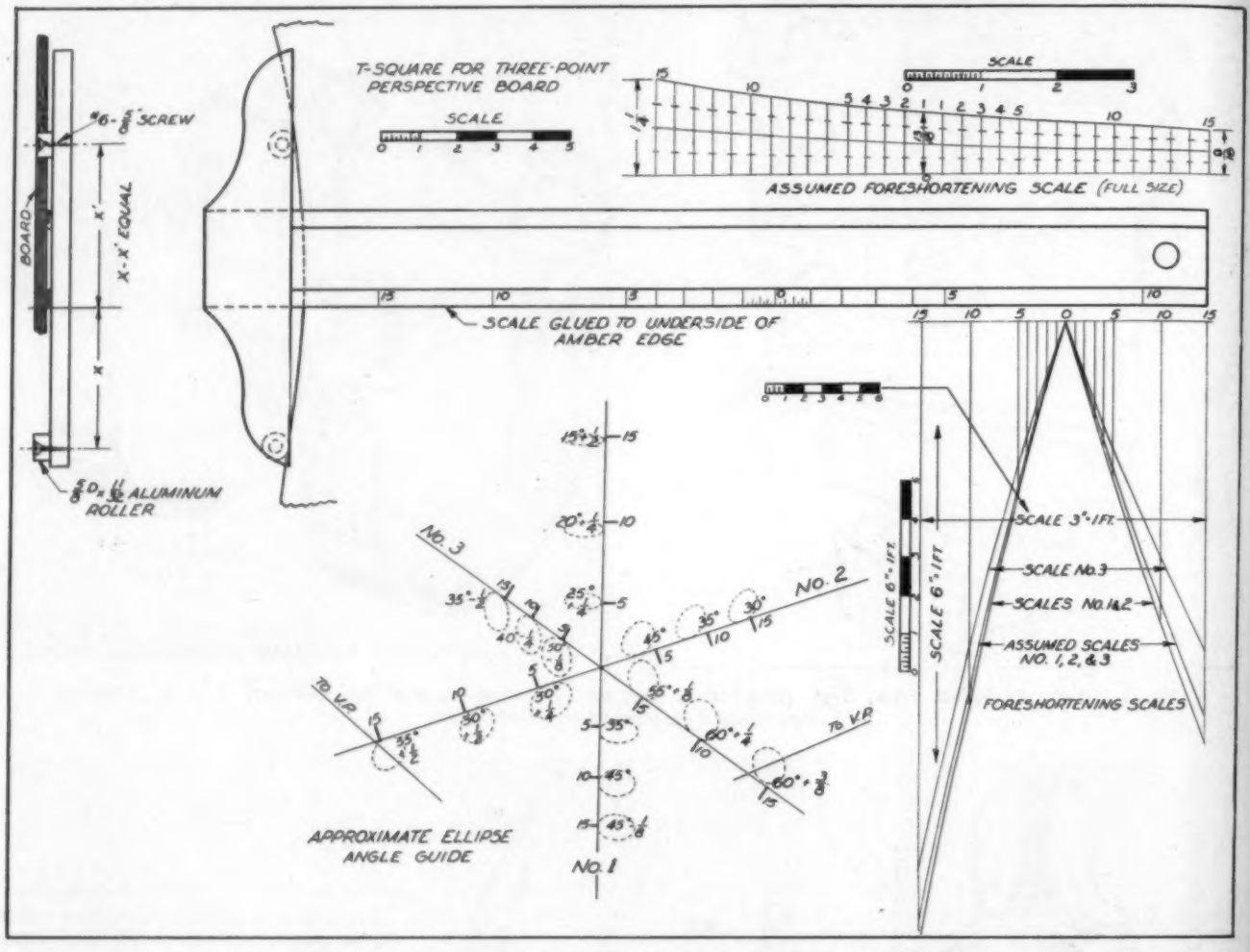


Fig. 4. T square fitted with rollers for use on a perspective board

general classroom work, but it is used extensively in commercial production illustration. The purpose of the drawing determines the type of shading to use. A shop production drawing need not be an artistic masterpiece, but must be clear and correct from an engineering standpoint. For advertising material and catalogues, a very finished drawing is desirable.

The war program demonstrated the value and usefulness of pictorial drawings for engineering purposes. Their reasons for using such drawings are (1) production illustrations are more easily understood than conventional engineering drawings; (2) they can be made more quickly; and (3) for many purposes they are the best medium for conveying the desired information.

To serve industry better, high schools and engineering schools should recognize and meet the need for more adequate training and improved instruction material in making pictorial drawings, and should find a place in the curriculum for the subject.

Reference books and articles: *Aircraft Production Illustration*, Tharratt. *Industrial Production Illustration*, Hoelscher, Springer, and Pohle. *Production Illustration*, Treacy. In the *Journal of Engineering Drawing*, Nov., 1943, and Nov., 1944: "Production Illustration," Potter (University of Minnesota); "Production Illustration," Springer (University of Illinois).

TOOLMAKERS PARALLEL CLAMP

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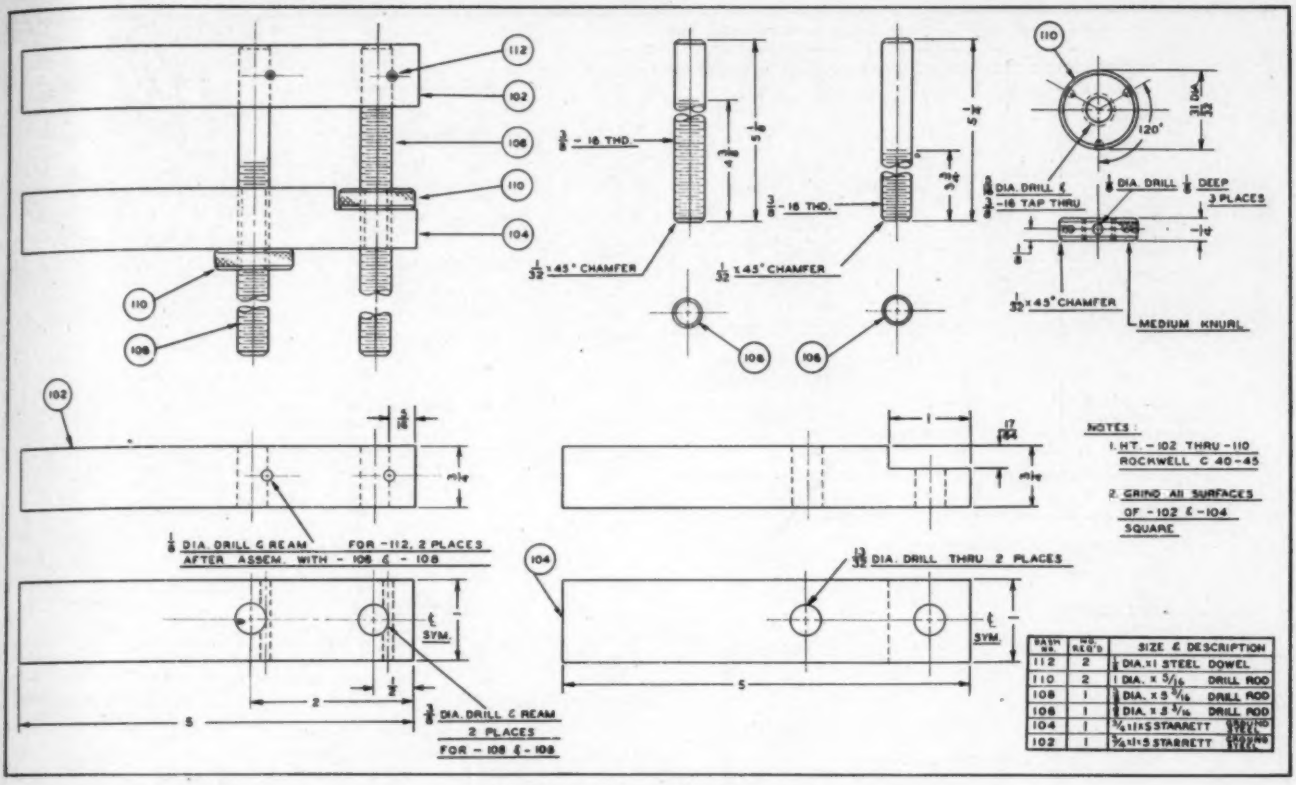
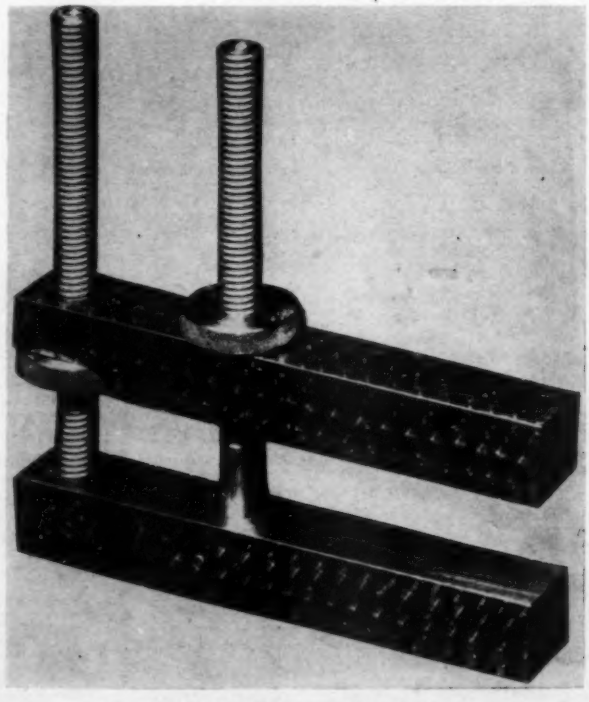
The never ending quest for new projects prompts the presentation of this tool. The project is educationally sound based on the general education industrial-arts objective and also the vocational trade information and skill goals. Both the drawing and the photograph indicate the usableness, practicality, and teaching potential of the projects. It is also apparent that the project is within the capability of secondary or vocational students and any shop equipment depending on the interpretation of the drawing. Limited equipment, no shaper or surface grinder for instance, will not preclude the project. Gold rolled steel can be used for the jaws of the clamp. Elaborate equipment will permit an industrial interpretation permitting shaping, treating, and grinding. Another interpretation also inherent in the project is the determination of the size of the knurled nuts. If rapid adjustment is at a premium the adjustment nuts can be made slightly larger than the jaws of the clamp. Rapid adjustment is made possible by forcing the clamp, in a direction perpendicular to the screws, over the top of a workbench or machine. Knurled nuts slightly smaller than


NOTES:
1. H.T. - 102 THRU - 110 ROCKWELL C 40-45
2. GRIND ALL SURFACES OF - 102 & - 104 SQUARE
MEDIUM KNURL
SIZE & DESCRIPTION
DRILL ROD
STARRETT

Details of parallel clamp



Toolmaker's parallel clamp

the thickness of the jaws permit greater functionalism as parallels and as a clamp. Holes bored in the knurled nuts permit tightening with a standard spanner wrench. The length of the screws may vary for special needs. The prescribed length has proved very satisfactory.

Small storage space is another virtue this tool possesses over the conventional clamp.

Beyond the educational value and the functionalism of this project, all industrial-educational teachers are mindful of the motivating force inherent in the making of a tool for the student's personal collection.

THREE POLE MOTOR

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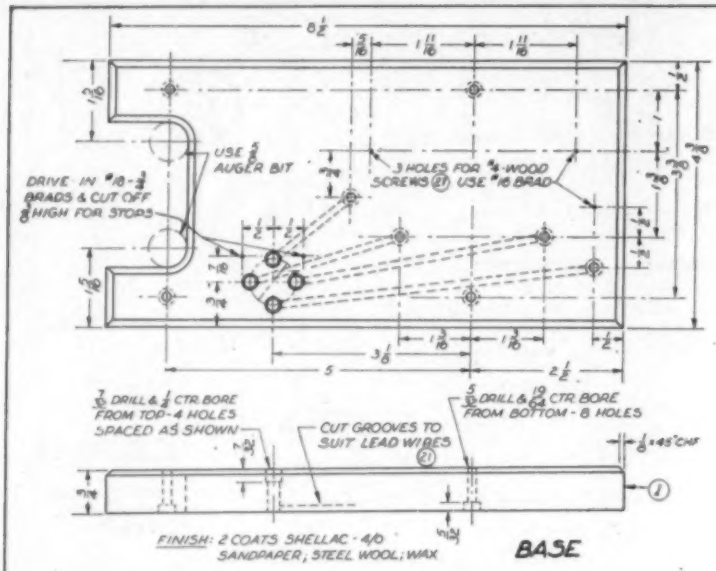
There is a real need for a practical electric motor suited to classroom construction for the industrial-arts course in elementary electricity.

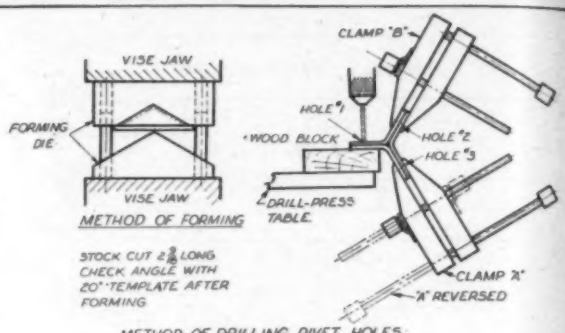
Beyond the interest value, which is extremely high, the teaching ramifications are most numerous. In the motor described in this article, the addition of a countershaft and a reversing switch multiply these values many times.

The motor is self-starting and is designed to operate on 6- to 8-volt transformers available to the majority of boys. It draws about 9 amperes current at full load. This is suitable for intermittent service and the voltage should not be exceeded.

With hoist cable winding on 5/32 shaft, the motor easily lifts a weight 3½ lb., and devel-


USE 5/8 AUGER BIT
DRIVE IN #18 - 3/4 BRADS & CUT OFF 5/8 HIGH FOR STOPS
3 HOLES FOR #4 WOOD SCREWS (27) USE #16 BRAD
CUT GROOVES TO SUIT LEAD WIRES (21)
FINISH: 2 COATS SHELLAC - 4/0 SANDPAPER; STEEL WOOL; WAX

BASE

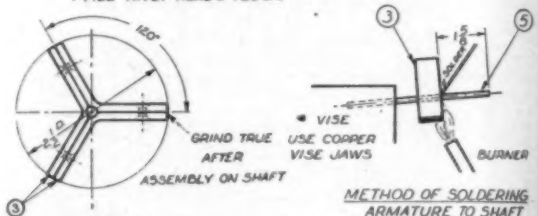


METHOD OF FORMING

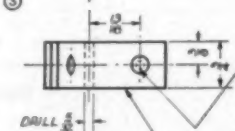
STOCK CUT 2 3/8 LONG CHECK ANGLE WITH 20° TEMPLATE AFTER FORMING

METHOD OF DRILLING RIVET HOLES USING TOOLMAKERS CLAMPS

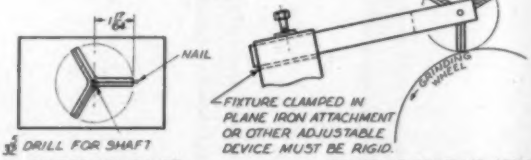
1. PUT SEGMENTS ON BENCH & CLAMP AS SHOWN
2. DRILL HOLE #1, CSK BOTH SIDES & RIVET. ALLOW 1/32 RIVET PROJECTION FOR FORMING HEAD.
3. REVERSE CLAMP "A" TO CLEAR DRILL.
4. REMOVE CLAMP "B" & DRILL, CSK, & RIVET HOLE #2
5. REMOVE CLAMP "A" & DRILL, CSK, & RIVET HOLE #3
6. PUT ARMATURE FLAT ON TABLE & DRILL SHAFT HOLE. (BE SURE DRILL IS OVER HOLE IN TABLE)
7. FILE RIVET HEADS FLUSH.



METHOD OF SOLDERING ARMATURE TO SHAFT

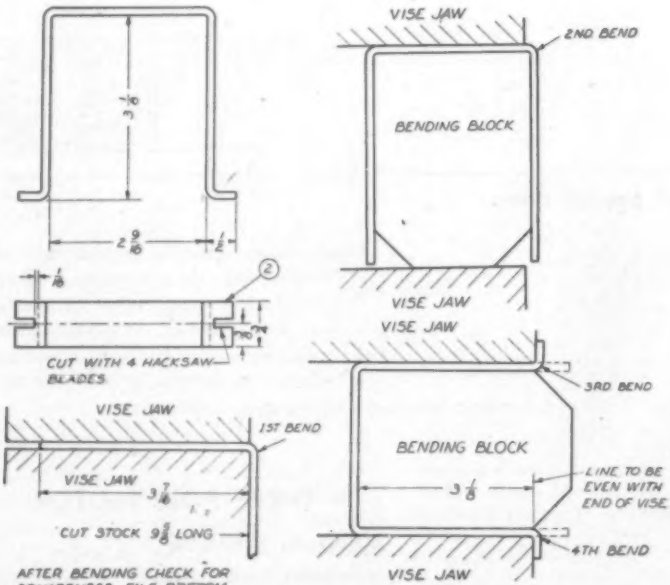


BALANCE FINISHED ARMATURE BY FILING SIDES OF SEGMENTS AS REQUIRED.


NAIL
1/32 DRILL FOR SHAFT
FIXTURE CLAMPED IN PLANE IRON ATTACHMENT OR OTHER ADJUSTABLE DEVICE. MUST BE RIGID.
GRINDING WHEEL

CENTERING GAUGE
FILE ENDS TO JUST CLEAR PIN
THIS GAUGES GRINDING ALLOWANCE.

METHOD OF GRINDING ARMATURE FOR TRUE ROTATION



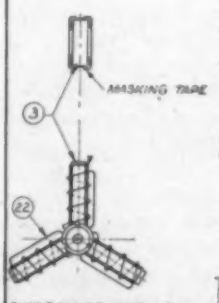
FIELD CORE

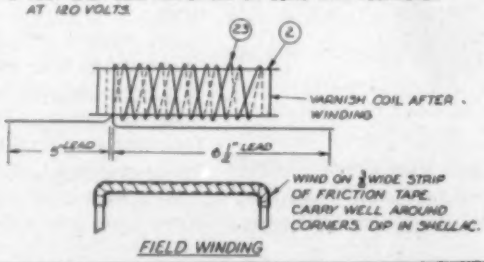
MAKING THE ARMATURE

1. COVER ARMATURE WITH 2 LAYERS OF MASKING TAPE OR PAPER AS SHOWN. SHELLAC, OR COAT WITH VARNISH
2. INSULATE SHAFT WITH SPAGHETTI AS SHOWN & VARNISH.

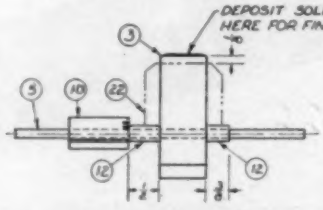
WINDING

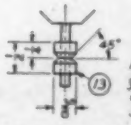
3. START WINDING AT CENTER. LEAVE 1" LEAD. WIND AS UNIFORMLY AS POSSIBLE TO AVOID UNBALANCE. END OF COIL TO BE 1/8" FROM END OF POLE AS SHOWN. STEP BACK EACH LAYER ONE TURN AS SHOWN. END AT CENTER AS NEARLY AS POSSIBLE & LEAVE 1" LEAD.
4. WIND ALL THREE COILS IN SAME DIRECTION & VARNISH.
5. TEST EACH COIL FOR SHORT ON CORE WITH VOLTMETER AT 120 VOLTS.
6. TEST EACH COIL FOR POLARITY WITH DRY CELL & COMPASS.
7. PRESS RUBBER COMMUTATOR CORE ON SHAFT.
8. FASTEN COMMUTATOR BARS IN PLACE TEMPORARILY WITH WIRE BAND & SOLDER LEADS IN PROPER SLOT.
9. GLUE BARS IN PLACE & BIND WITH WIRE. BE SURE SPACES BETWEEN BARS ARE OPEN & EXACTLY IN LINE WITH ARMATURE POLES.
10. WHEN DRY, POLISH COMMUTATOR, TEST & BIND ENDS WITH LINEN THREAD. VARNISH.
11. BALANCE BY ADDING SOLDER TO ENDS OF POLES.




VARNISH COIL AFTER WINDING
5" LEAD
6 1/2" LEAD
WIND ON 3/8 WIDE STRIP OF FRICTION TAPE. CARRY WELL AROUND CORNERS. DIP IN SHELLAC.

FIELD WINDING





ARMATURE DETAILS AND ASSEMBLY

Fig. 1

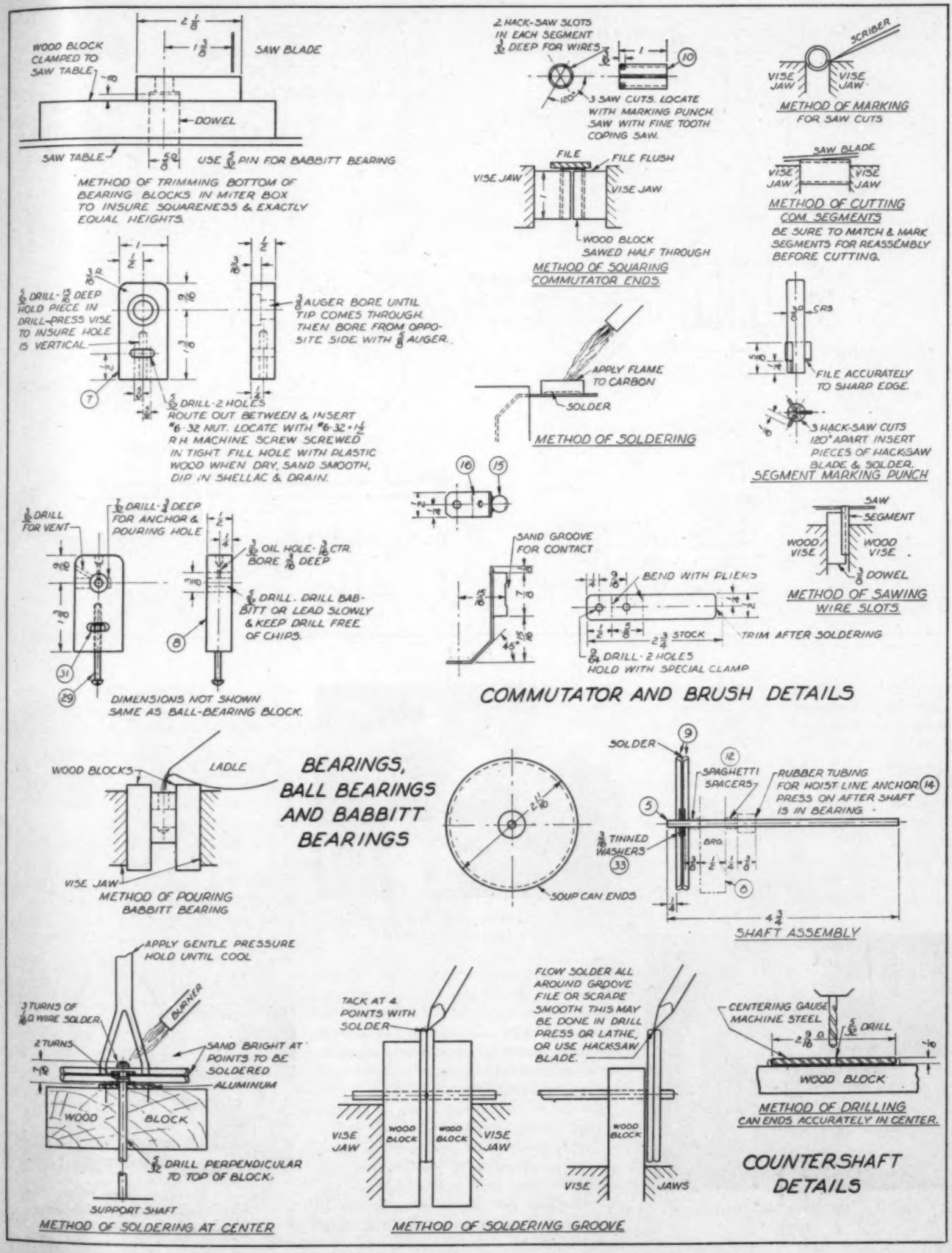

WOOD BLOCK CLAMPED TO SAW TABLE
SAW BLADE
DOWEL
SAW TABLE
USE 5/16 PIN FOR BABBITT BEARING
METHOD OF TRIMMING BOTTOM OF BEARING BLOCKS IN MITER BOX TO INSURE SQUARENESS & EXACTLY EQUAL HEIGHTS.
5/16 DRILL · 15/16 DEEP HOLD PIECE IN DRILL-PRESS VISE TO INSURE HOLE IS VERTICAL
3/8 AUGER BORE UNTIL TIP COMES THROUGH. THEN BORE FROM OPPOSITE SIDE WITH 3/8 AUGER.
5/16 DRILL · 2 HOLES ROUTE OUT BETWEEN & INSERT #6-32 NUT. LOCATE WITH #6-32 · 1 1/4 R.H. MACHINE SCREW SCREWED IN TIGHT. FILL HOLE WITH PLASTIC WOOD WHEN DRY, SAND SMOOTH, DIP IN SHELLAC & DRAIN.
DRILL FOR VENT
7/16 DRILL · 3/4 DEEP FOR ANCHOR & POURING HOLE
3/16 OIL HOLE · 3/16 CTR. BORE 3/16 DEEP
5/16 DRILL. DRILL BABBITT OR LEAD SLOWLY & KEEP DRILL FREE OF CHIPS.
DIMENSIONS NOT SHOWN SAME AS BALL-BEARING BLOCK.
2 HACK-SAW SLOTS IN EACH SEGMENT 1/16 DEEP FOR WIRES
3 SAW CUTS. LOCATE WITH MARKING PUNCH SAW WITH FINE TOOTH COPING SAW.
FILE
FILE FLUSH
VISE JAW
WOOD BLOCK SAWED HALF THROUGH
METHOD OF SQUARING COMMUTATOR ENDS
APPLY FLAME TO CARBON
SOLDER
METHOD OF SOLDERING
SCRIBER
METHOD OF MARKING FOR SAW CUTS
METHOD OF CUTTING COM. SEGMENTS
BE SURE TO MATCH & MARK SEGMENTS FOR REASSEMBLY BEFORE CUTTING.
CRS
FILE ACCURATELY TO SHARP EDGE.
3 HACK-SAW CUTS 120° APART INSERT PIECES OF HACK-SAW BLADE & SOLDER.
SEGMENT MARKING PUNCH
SAND GROOVE FOR CONTACT
BEND WITH PLIERS
2 3/4 STOCK
TRIM AFTER SOLDERING
5/64 DRILL · 2 HOLES HOLD WITH SPECIAL CLAMP
SAW SEGMENT
WOOD VISE
DOWEL
METHOD OF SAWING WIRE SLOTS
COMMUTATOR AND BRUSH DETAILS
WOOD BLOCKS
LADLE
VISE JAW
METHOD OF POURING BABBITT BEARING
BEARINGS, BALL BEARINGS AND BABBITT BEARINGS
SOLDER
SPAGHETTI SPACERS
RUBBER TUBING FOR HOIST LINE ANCHOR PRESS ON AFTER SHAFT IS IN BEARING
3/16 TINNED WASHERS
BRG
SOUP CAN ENDS
4 3/4
SHAFT ASSEMBLY
APPLY GENTLE PRESSURE HOLD UNTIL COOL
3 TURNS OF 20 WIRE SOLDER
BURNER
2 TURNS
SAND BRIGHT AT POINTS TO BE SOLDERED
ALUMINUM
WOOD BLOCK
5/32 DRILL PERPENDICULAR TO TOP OF BLOCK.
SUPPORT SHAFT
METHOD OF SOLDERING AT CENTER
TACK AT 4 POINTS WITH SOLDER
VISE JAW
WOOD BLOCK
METHOD OF SOLDERING GROOVE
FLOW SOLDER ALL AROUND GROOVE FILE OR SCRAPE SMOOTH. THIS MAY BE DONE IN DRILL PRESS OR LATHE, OR USE HACKSAW BLADE.
VISE JAWS
CENTERING GAUGE MACHINE STEEL
5/32 DRILL
WOOD BLOCK
METHOD OF DRILLING CAN ENDS ACCURATELY IN CENTER.
COUNTERSHAFT DETAILS

Fig. 2. Details of bearings, commutator and brushes, and countershaft

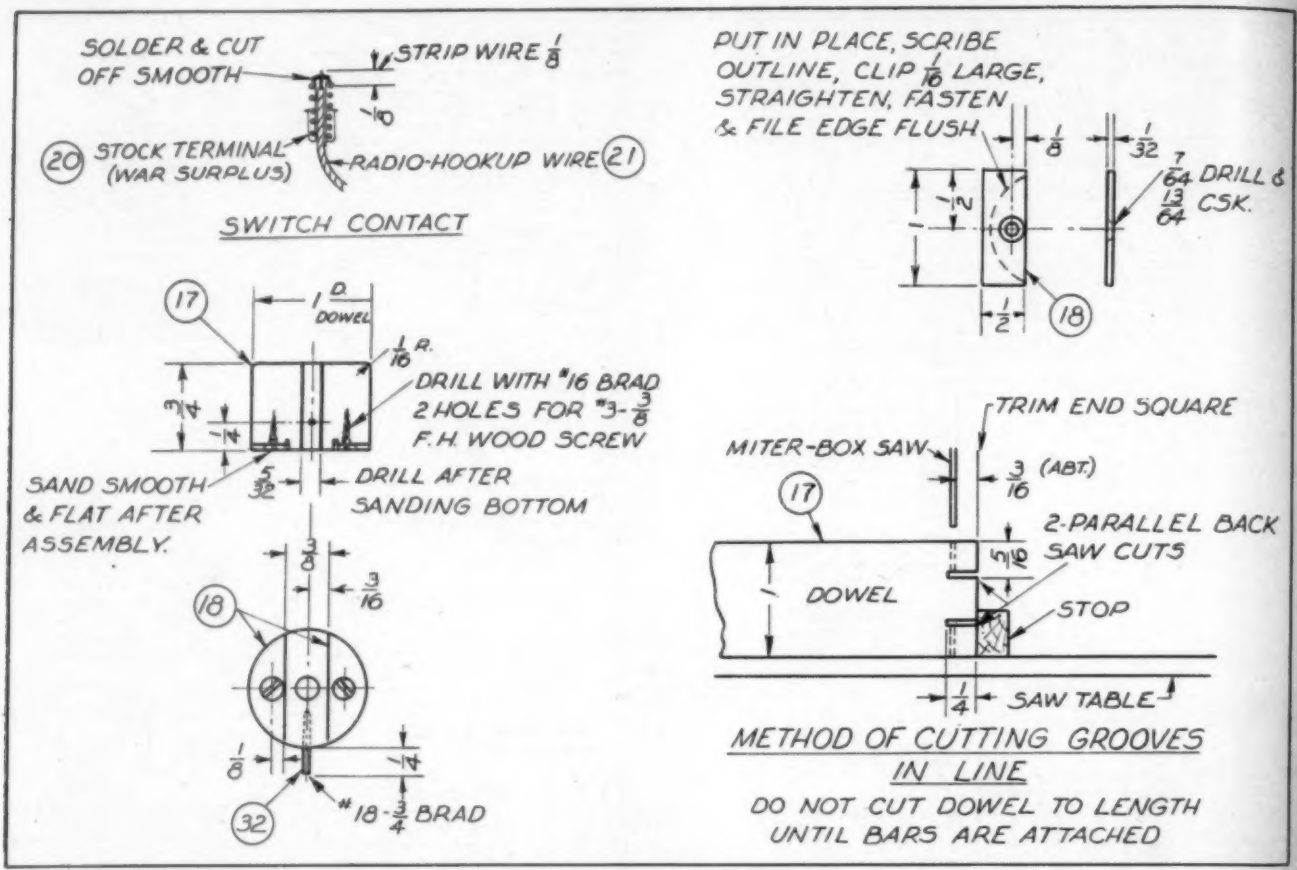


Fig. 3

ops roughly 1/100 horsepower at the countershaft. Its performance delights the boys immensely and they spend many hours at home experimenting with it and find many useful applications.

The construction and methods described here are a further development along lines being successfully used in the eighth-grade electrical classes of the Milwaukee public schools. Many of the features now in use are incorporated in this design along with modifications and new design.

Fig. 5. Winding the armature coils

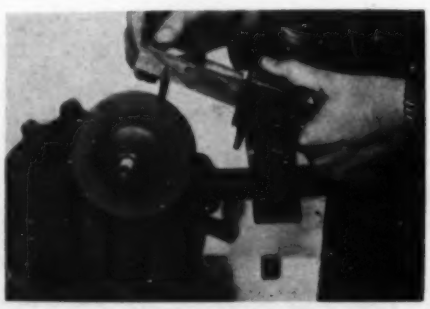


Fig. 6. Grinding armature pole ends for true rotation

The whole development of this type of electric motor is the result of concerted effort by members of the industrial-arts department, individually and as a group, to find suitable materials and develop methods satisfactory for the grade level and equipment available. It has been successful to a high degree.

The use of fixtures and gauges is essential to good results, especially with large groups, but these devices have been kept as simple and easily constructed as possible. The large number of motor parts is in some ways helpful. It allows the use of equipment to be distributed to better advantage. The design shown is the only easily constructed substantial three-pole armature suitable for classroom use which the writer has seen. It is unusually easy to construct it uniformly well.

There are several features of the design that minimize assembly difficulties and compensate for inaccurate construction. The bearing blocks may be rotated on the bolt to secure alignment and free movement of the shaft, then tighten securely. The field core is then bent slightly to a close-running fit with the already mounted armature and centered accurately, by sliding on the screw slots.

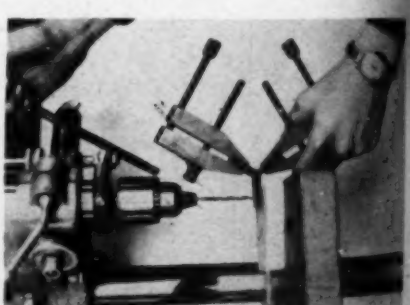
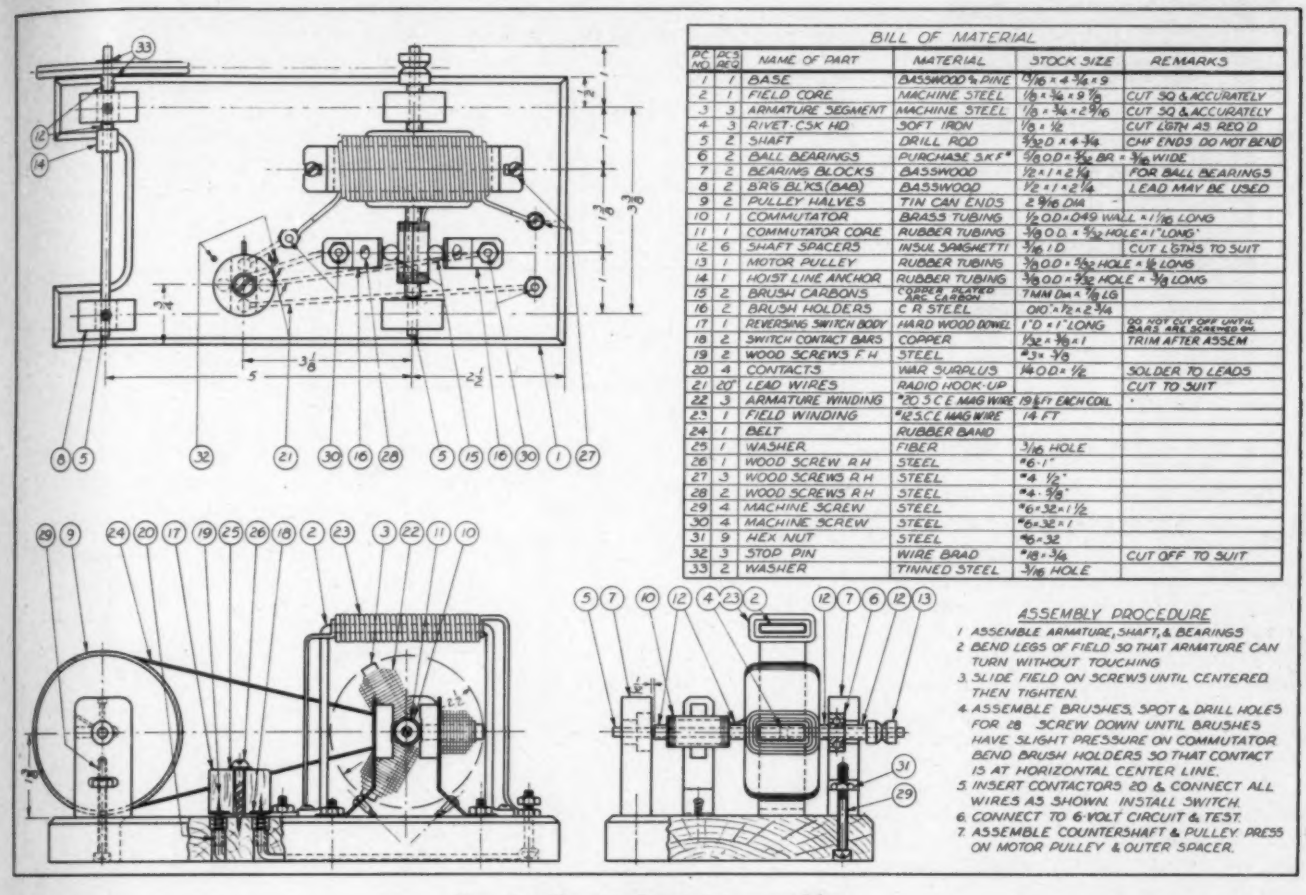


Fig. 7. Drilling rivet holes. Note that lower clamp will clear countersink from bottom



BILL OF MATERIAL

PC NO.	DES REQ	NAME OF PART	MATERIAL	STOCK SIZE	REMARKS
1	1	BASE	BASSWOOD & PINE	5/16 x 4-3/4 x 9	
2	1	FIELD CORE	MACHINE STEEL	1/8 x 3/4 x 9 3/8	CUT SQ & ACCURATELY
3	3	ARMATURE SEGMENT	MACHINE STEEL	1/8 x 3/4 x 2 9/16	CUT SQ & ACCURATELY
4	3	RIVET-CSK HD	SOFT IRON	1/8 x 1/2	CUT LGTH AS REQ'D
5	2	SHAFT	DRILL ROD	3/32 D x 4-3/4	CHF ENDS DO NOT BEND
6	2	BALL BEARINGS	PURCHASE SKF*	3/8 O.D. x 3/32 BR x 3/16 WIDE	
7	2	BEARING BLOCKS	BASSWOOD	1/2 x 1 x 2 1/4	FOR BALL BEARINGS
8	2	BRG BLKS (BAB)	BASSWOOD	1/2 x 1 x 2 1/4	LEAD MAY BE USED
9	2	PULLEY HALVES	TIN CAN ENDS	2 9/16 DIA	
10	1	COMMUTATOR	BRASS TUBING	1/2 O.D. x .049 WALL x 1 1/16 LONG	
11	1	COMMUTATOR CORE	RUBBER TUBING	3/8 O.D. x 3/32 HOLE x 1" LONG	
12	6	SHAFT SPACERS	INSUL SPAGHETTI	3/16 I.D.	CUT LGTHS TO SUIT
13	1	MOTOR PULLEY	RUBBER TUBING	3/8 O.D. x 3/32 HOLE x 1/2 LONG	
14	1	HOIST LINE ANCHOR	RUBBER TUBING	3/8 O.D. x 3/32 HOLE x 3/8 LONG	
15	2	BRUSH CARBONS	COPPER PLATED ARC CARBON	7MM Dia x 3/8 LG	
16	2	BRUSH HOLDERS	C R STEEL	.010" x 3/4 x 2 3/4	
17	1	REVERSING SWITCH BODY	HARD WOOD DOWEL	1" D x 1" LONG	DO NOT CUT OFF UNTIL BRASS ARE SCREWED ON
18	2	SWITCH CONTACT BARS	COPPER	1/32 x 3/8 x 1	TRIM AFTER ASSEM
19	2	WOOD SCREWS F H	STEEL	#3 x 3/8	
20	4	CONTACTS	WAR SURPLUS	1/4 O.D. x 1/2	SOLDER TO LEADS
21	20"	LEAD WIRES	RADIO HOOK-UP		CUT TO SUIT
22	3	ARMATURE WINDING	#20 S C E MAG WIRE	19 ft EACH COIL	
23	1	FIELD WINDING	#12 S C E MAG WIRE	14 FT	
24	1	BELT	RUBBER BAND		
25	1	WASHER	FIBER	3/16 HOLE	
26	1	WOOD SCREW R H	STEEL	#6-1"	
27	3	WOOD SCREWS R H	STEEL	#4 1/2"	
28	2	WOOD SCREWS R H	STEEL	#4-3/8"	
29	4	MACHINE SCREW	STEEL	#6-32 x 1 1/2	
30	4	MACHINE SCREW	STEEL	#6-32 x 1	
31	9	HEX NUT	STEEL	#6-32	
32	3	STOP PIN	WIRE BRAD	#18 x 3/4	CUT OFF TO SUIT
33	2	WASHER	TINNED STEEL	3/16 HOLE	

ASSEMBLY PROCEDURE

1. ASSEMBLE ARMATURE, SHAFT, & BEARINGS
2. BEND LEGS OF FIELD SO THAT ARMATURE CAN TURN WITHOUT TOUCHING
3. SLIDE FIELD ON SCREWS UNTIL CENTERED THEN TIGHTEN.
4. ASSEMBLE BRUSHES, SPOT & DRILL HOLES FOR 28 SCREW DOWN UNTIL BRUSHES HAVE SLIGHT PRESSURE ON COMMUTATOR. BEND BRUSH HOLDERS SO THAT CONTACT IS AT HORIZONTAL CENTER LINE.
5. INSERT CONTACTORS 20 & CONNECT ALL WIRES AS SHOWN. INSTALL SWITCH.
6. CONNECT TO 6-VOLT CIRCUIT & TEST.
7. ASSEMBLE COUNTERSHAFT & PULLEY. PRESS ON MOTOR PULLEY & OUTER SPACER.

Fig. 4. Three-pole motor assembly

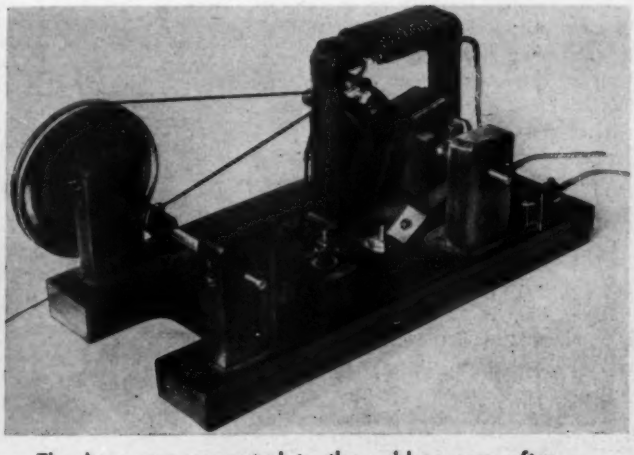


Fig. 8. (Left) Steps and tools in commutator construction. The bars are cemented to the rubber core after soldering the coil ends. Liquid glue is satisfactory but a suitable insulating varnish baked at 175 deg. F. to 225 deg. F., for 1½ or 2 hrs., has been used with good results. We used General Electric No. 9564. Fig. 9. (Right) Completed motor

This assembly is almost foolproof. The wood bearing blocks are very easily made. They are cut to size in the miter box and sanded. These blocks provide rigid vibration-free operation. In this respect they are superior to metal mountings.

Use of the reversing switch eliminates need for co-ordinating field and armature connections. By winding and testing each pole separately faulty winding is more easily remedied and polarity may be reversed if a coil is wound backward.

Brush mounting should be carefully checked. When adjusted under slight pressure they should be vertical and contact the commutator at the horizontal center line.

A number of special materials are called for. These have been found essential to solving

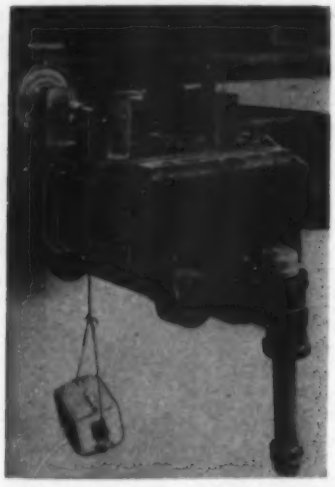


Fig. 10. Motor starting and lifting 3½-lb. weight at 7½ volts

some of the inherently troublesome construction problems in a simple yet effective way. A good example is the use of rubber tubing for commutator core and a suitable brass tubing to match. The core tubing is a size and type used for baby carriage tires.

The use of copper plated arc carbons for brushes is another very satisfactory solution. Their low resistance and large solder area allow the use of heavy current and they do not melt loose in service. High conductivity and low friction of the carbons compare favorably with the most suitable brush carbon obtainable and at less expense.

Ball bearings are desirable but the babbitt bearings are satisfactory and cheaper if cost or availability rule the former out.

A few war surplus items are used, such as insulating spaghetti and contactors, but substitutes are available for these.

Single cotton enamel magnet wire is recommended. If enamel wire is used the iron cores must be insulated most carefully to avoid cutting through and suitable types of varnishes that will not dissolve the enamel must be used. Avoid shellac.

The author does not claim that the winding is optimum but it is the result of considerable, careful experimenting to produce efficient performance in the 6–8 volt range.

The working drawings give all essential information and the methods of fabrication. Very little demonstration is necessary. This is important where a variety of operations are carried on at the same time. The methods indicated are also suggestions to instructors using the project.

Few last words are more famous than these: "Don't worry. I've been driving for years. . ."

A LESSON IN MEASURING

GEORGE WELCH
Nunda Central School
Dalton, N. Y.

Most students entering industrial arts display a lack of skill in reading a ruler and measuring which is a serious obstacle to effective work in shop.

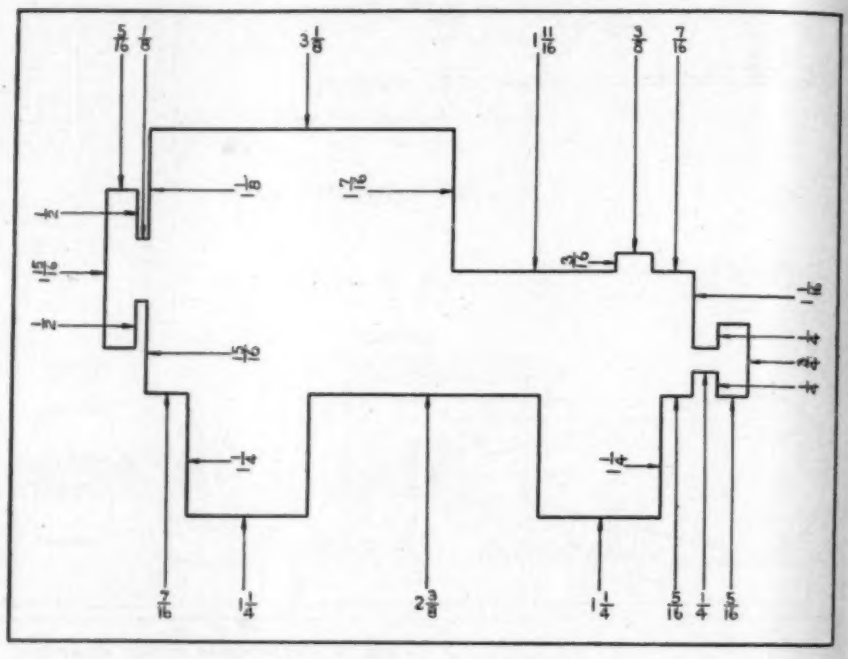
No great amount of success has been achieved by either the academic or industrial-arts departments in teaching this fundamental ability — yet it is a basic skill of very great importance in school and later life.

A method of teaching this lesson which takes one 45-minute period has been found to be highly successful. In a combined agriculture and industrial-arts situation it may be taught in the agricultural teacher's classroom on one of the days when his boys are using the shop. Of course the lesson should be one of the first for boys entering industrial arts.

A pencil, ruler, and a piece of 8½ by 11-in. plain white paper is needed for each student. The teacher needs a blackboard and chalk, and a previously prepared drawing similar to the one shown. A large model ruler teaching aid would be helpful.

The lesson may be started with a brief introductory talk on "What we are going to do, and why what we are going to do is important to you as shop students." Using a blackboard drawing the parts of an inch are taught in the customary manner — asking numerous questions to keep up interest and check on progress.

It is surprising how quickly the students all learn to read a ruler. At least they can answer most of the questions which are asked about measuring. Most lessons end here, the teacher is happy, the students soon forget what they have learned, and more harm than good has been done because the next time the same lesson on measuring is needed it will be "old stuff" and much duller and even less effective.



A lesson in measuring

The way to make the retention of this information more permanent is to have the students apply it immediately.

In order to do this a project is used which is a game and a problem. It is fun and a challenge to most students. As you can see from the drawing, the project in this case is an army vehicle.

Rulers, papers, and pencils are passed out and the procedure of the game explained. Something like this may be said, "In order to find out if you can really use a ruler I'd like to have you do some measuring on the papers which you have. Please follow these directions carefully:

"Place the paper before you in a horizontal position. (Show how.) Measure 4⅝ in. from the upper left corner along the top edge of the paper. Make a mark at this point. Measure down from this point 2¾ in. Show on the board that the measurement should be as nearly vertical as possible. Now measure 3⅛ in. from this point straight over to the right. Draw a line with a ruler and write the length of the line above it. Measure down

from the right end of this line 1 7/16 in. Draw a line, etc."

The last line should meet the first line at the beginning point. Actually it seldom does, but it is often close. There is always a lot of interest when the drawings have been completed — comparing of work, finding mistakes, etc. Some of the things which can be done now are these:

1. Drawings may be looked over with the students comparing their work with the drawing previously prepared. Usually it is not necessary to pick out mistakes. Students find them without help. A good feature of this lesson is that it gives an excellent evaluation of how much learning took place. It is also evident just where each student is weak.

2. Duplicated sheets may be given out with directions for another problem to be done at home.

3. Addition and subtraction and most other phases of work with fractions may be brought in with such questions as, "What is the total length of the jeep?" "How long would it be if the length of the hood was 1¼ instead of 1 11/16?"

4. The best papers may be displayed.

5. Any student who is not satisfied with his work can be given until the next day to do it over before it is graded.

In order to vary this lesson from year to year airplanes, boats, animals, school letters, or furniture may be used. The drawings should not be too complicated — about ½ minute per line should be allowed.

This lesson, like any other, depends for its success upon snap, alertness, and a sense of humor.

INDIAN SILVERSMITHING

BEN HUNT
Hales Corners, Wis.

Emery Stick

After having used an emery stick on your jewelry or art metal work, you will wonder how you ever got along without one. Emery paper can be used for a number of things. For jewelry work a fine polishing paper is best, and while it does not polish, it is very satisfactory for the step before polishing. File marks and fine scratches can easily be removed with it and when the paper is worn too smooth, all one needs to do is tear off one layer and there are then three nice new layers ready for use.

The stick itself can be anywhere from ½ to ¾ in. square, or rectangular. The one shown is 9/16 in. square, which seems to be a good size for Indian silversmithing.

Start out by laying stick exactly along one edge of the abrasive paper, Figure 1. Then hold the stick down firmly and score the emery paper with any smooth slightly dulled tool, such as a dull kitchen knife, as shown in Figure 2. Fold over the edge by rolling the

Fig. 1. Starting to fold the abrasive cloth or paper around the stick

stick and score for the next edge. See Figure 3. Continue doing this until you have used up the sheet of emery paper. It is usually cut off after the last lap has overlapped the beginning. Thus, when you are down to the last of the

Fig. 2. Creasing the abrasive cloth or paper before making the first fold

paper, the two edges are fastened to the stick. You lose one working face out of four, but there is no other waste. Fastening the paper can be done with tacks, small nails, or by stapling. See Figure 4. Small nails, cut off to about ½ in., can be countersunk slightly making the nailed side usable. But the nail

Fig. 3. Making the crease before making the next fold

Fig. 4. Stapling the last fold to the stick

heads must be below the surface of the emery paper.

Do not use a good silver knife for scoring the paper, as the blade will be worn down after the first round is on the stick as you will be pressing it against the gritty side of the paper.

VISUAL AIDS

LEONARD A. KROLL
Machine Shop Teacher
Samuel Gompers Vocational and Technical High School
Brooklyn, N. Y.

In many schools, shop talks are given in rooms other than the shop. In addition, these "theory" rooms are often not equipped for this instruction so that proper visual aids are frequently unavailable. Cardboard charts are easy to transport and serve well in a situation of this kind except when they are large. Figure 1 shows a large drawing of a shaper on one side and a milling machine on the other side (not shown). A shade, reinforced with two brass grommets for hanging, is all the material used. When stored, it fits in the corner of a clothes locker taking up a 2 by 2 by 42-in. space. It may easily be carried from room to room. A pointer may also be rolled up with

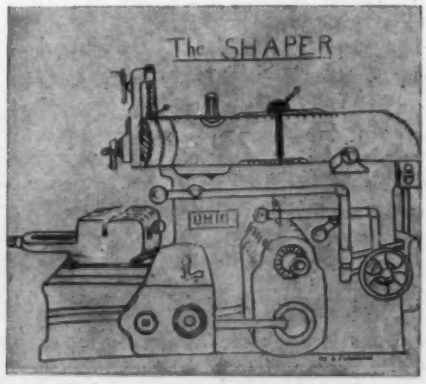


Fig. 1. Diagrammatic sketch to accompany the talk on the shaper

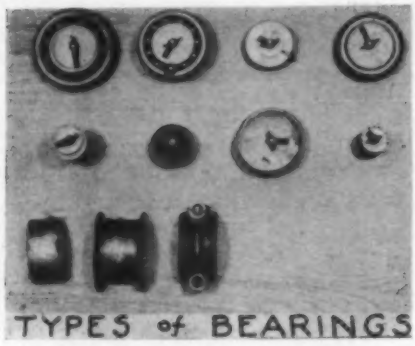


Fig. 2. Diagrammatic sketch

it for additional efficiency. Some students have artistic talents and with a little help and encouragement can do this work. The illustration in Figure 1 was made by a fourth term student.

Figures 2 and 3 illustrate a type of board that has been found very useful in situations where tools, materials, and equipment are to be discussed. The boards are easily stored and

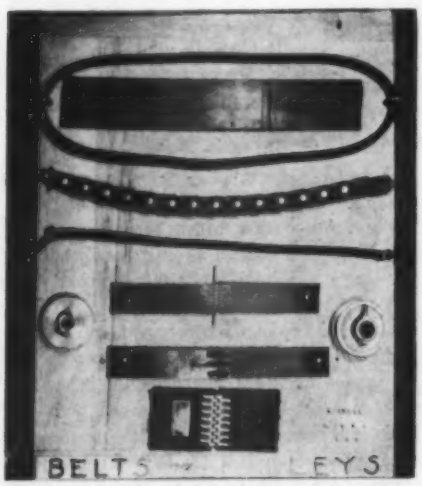


Fig. 3. Visual aid for talk on belts and pulleys

transported, and they keep many small parts intact. Each item is attached to the 18 by 24-in. board so that it may be removed during the lesson. Slotted washers, wing nuts, hooks, etc., serve this purpose well.

When the class is ready for a shop talk on belts and pulleys, the board in Figure 3 is hung before the class, and all the necessary visual aids are at the instructor's finger tips.

A total of 1177 different forms of tree — 862 species, 228 varieties, and 87 hybrids — grow in the United States, according to the U. S. Department of Agriculture Check List. — *National Lumber Manufacturers Association.*

A PLASTIC DRESSER OR DESK LAMP

E. L. KURTH
Industrial Arts Department
State Normal and Industrial College
Ellendale, N. Dak.

An attractive and modern project that can be made at almost any grade level from materials easily available at hardware and variety stores is a dresser or desk lamp.

Plastic dresser lamp

BILL OF MATERIALS

No. of pieces	*Name*
2	Plastic juice glasses
1	Plastic saucer
1	Lamp socket
1 length	¼-in. pipe
1	⅜-in. fixture nut
1	Lamp shade
1	Electrical plug
6 ft.	Cord

Although the skills involved are few it does provide an opportunity for the following manipulative processes: finding the center of circles, drilling holes in plastic, cutting and threading pipes, and wiring a lamp socket.

If pipe cutting and threading tools are not available in the shop, you may have the pipe cut to the correct length at any hardware store or plumbing shop. You also can have the thread cut at the same time and place.

Selection of proper colors to use for the glasses, saucer, and shade can be left up to the student with the principles of color design being stressed and used.

No gluing or shaping is required. The length of pipe with the nut on the bottom and the lamp socket on top holds the three pieces together.

For variation a wooden base could be used instead of the saucer. Using a wooden base would involve other skills and processes including finishing.

SHOP STUDENTS MAKE LARGE INCINERATORS

KEITH KERWIN
San Jose, Calif.

Students in John Bahr's vocational welding class at Edison Vocational High School, San Bernardino, Calif., gained valuable "live job" training by constructing six large all-steel all-welded incinerators. The construction of these incinerators provided the welding students with experience welding in all positions, including vertical and overhead. Blueprints had to be read and interpreted before construction could begin. Because the entire class worked on the project, several lessons of group co-

Incinerator made by the Edison Vocational High School welding class at San Bernardino, Calif.

operation were learned. The most important of these was how to work safely with a large group. This safety factor is very important in all types of heavy construction work, but particularly so with welding. Finally, the students gained experience in learning how to utilize scrap and salvaged material.

The specifications for the incinerators were provided by the city school maintenance department. Detailed blueprints were drawn from these specifications by the mechanical drawing classes of the San Bernardino Senior High School. Thus, in addition to providing a complex learning situation for the vocational welding class, this construction project enabled the high school industrial-arts mechanical drawing classes to see their blueprints actually come to life in the form of a practical, usable object.

The incinerators are approximately 4 ft. in diameter by 6 ft. in height up to the cone. The cones are 30 in. high and taper to an 18-in. diameter, where the stacks rise an additional 18 in. The 6-ft. barrels of the incinerators are lined with firebricks. The incinerators were constructed from 3/16-in. steel plate salvaged from truck cab covers obtained through the State Educational Surplus Agency. They were welded with single passes with a 5/32-in. reverse polarity electrode.

This project, aside from its value as a teaching aid, served a very real need that existed in the city school system. Because of a rapidly expanding building program and a limited budget, the city system would have been unable to purchase six new incinerators. But because the city system includes a large and well-organized vocational education program, six schools in San Bernardino now have solidly constructed, better-than-new incinerators.

DRILL JIG FOR CENTERING PLASTIC ROD

NORMAN BROOKS
Penn High School
Greenville, Pa.

Due to the fact that plastic rod is manufactured with such a variation in size, it is practically impossible to drill successive pieces and get them drilled exactly in the center. To overcome this drilling problem the drill jig shown in Figure 1 was designed and built.

Care must be taken to center the first piece of rod to be drilled and after it is clamped in

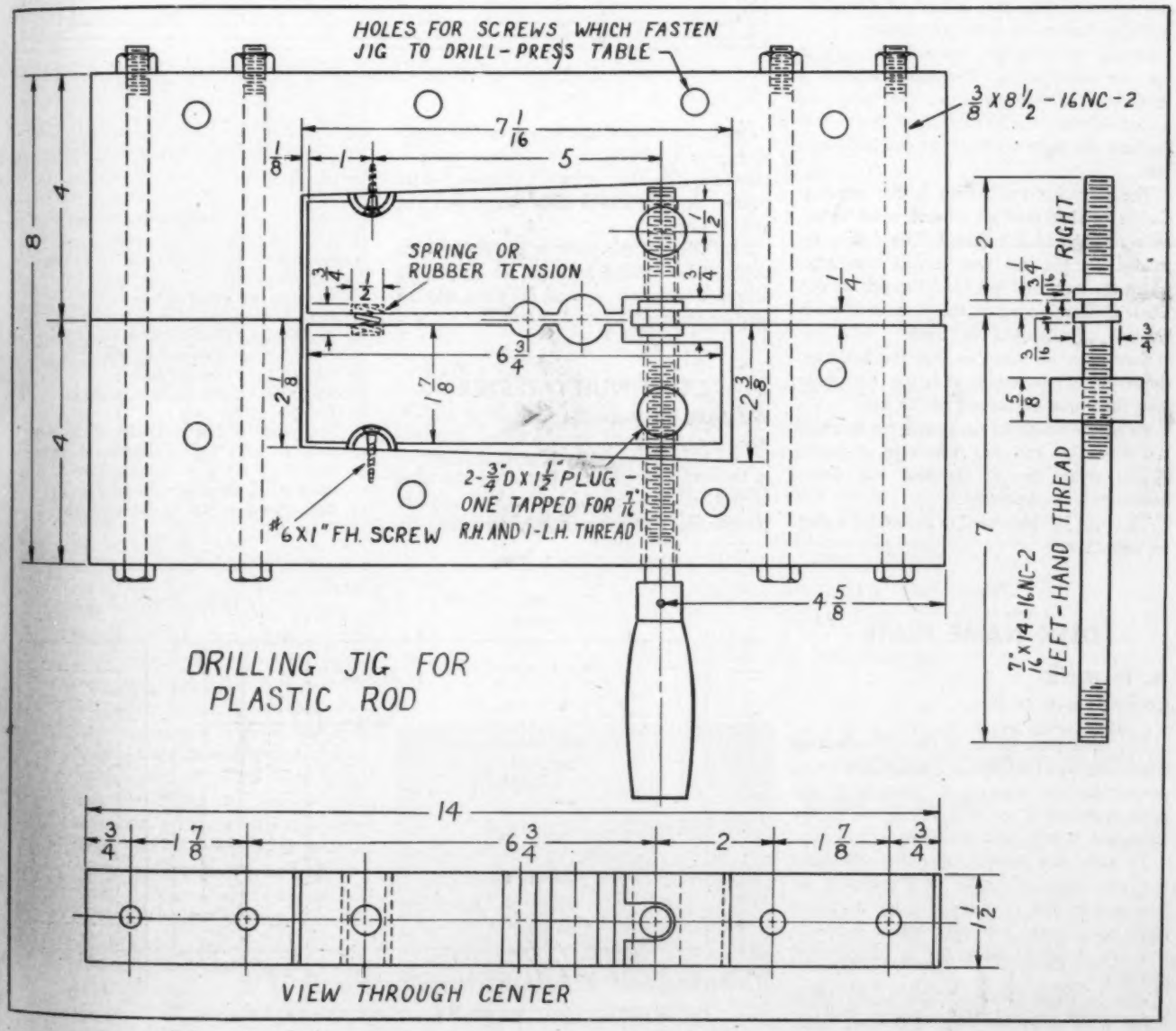


Fig. 1. Drill jig for centering plastic rod

the jig and the jig is clamped or bolted to the drilling table, successive pieces of the same size rod can be drilled true, and in the center even though they have the allowable tolerance.

The frame is made of maple, bolted together with two ⅜-in. bolts at each end. Several holes are drilled through the frame at hit or miss positions to facilitate in fastening to the drilling table.

The jaws are made of maple and they pivot at each end on a piece of ⅜-in. pipe cut in half from end to end. These pieces are each drilled and countersunk for two No. 6 f.h. screws. The pivots are then screwed to the inside of the frame. The jaws have a cove cut in them to fit the pipe pivots and jaws are then held out tight and in place with a piece of live rubber placed between pivot points in jaws and compressed tightly. A short stiff spring may be used instead of rubber by recessing spring into each jaw slightly.

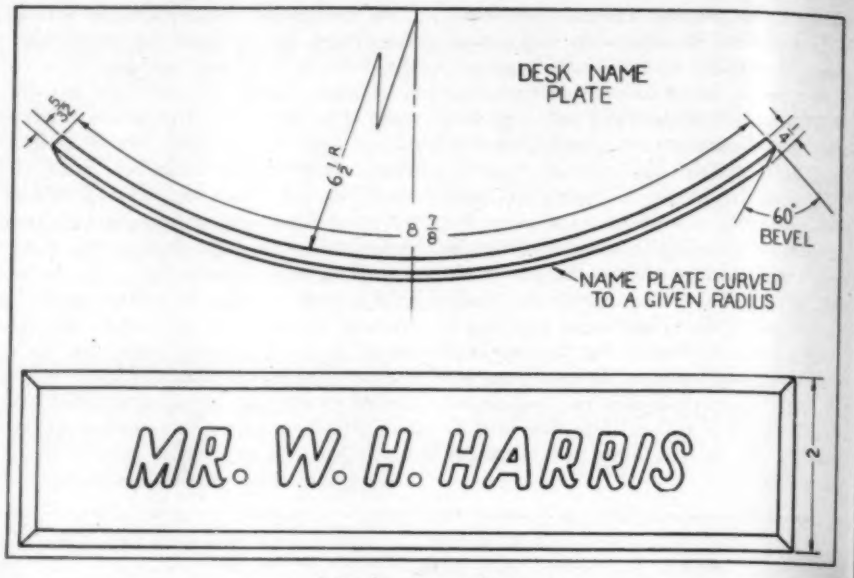
Several different size cuts can be made in jaws for clamping rod. The author clamped a thin strip of wood between the jaws and drilled different size holes through jaws, making sure the same amount was cut from each jaw.

The clamping mechanism is the same or similar to that used on a hand wood clamp, with a right and left thread. Two collars are welded on the rod and turned true after which the right and left hand threads are cut. These collars fit snug on the ¼-in. steel guide bar that is fastened in the frame.

Care must be taken so that the left hand thread is cut on handle end, this will make jaws turn tight on turning to the right.

To secure handle to the screw, file threaded rod square at end and drill hole in handle ⅛ in. under size of threaded rod. Drive handle on after assembly.

This tool has been used in the author's shop for some time.



Desk name plate

DESK NAME PLATE

W. H. BULLIS
Canandaigua, N. Y.

The name plate shown in the accompanying illustration has proved to be an interesting project for the students of plastics. It also gives opportunity for teaching the use of the fundamental tools and processes.

To make this project, cut out on the band saw one piece of Lucite or Plexiglas 2 in. wide and as long as is required for the name plate being made. The plate shown herewith was cut 10 in. to allow for 13 alphabetical characters.

File the edges to remove saw marks. Then finish with sandpaper, No. 2/0 steel wool, and finally by buffing on the polishing wheel.

Cut letters on the reverse side to the depth of ½ the thickness of the plastic, using a Mototool, Handee grinder, flexible shaft grinder, or Carvit. The plate shown was cut with a Carvit.

Heat over electric plate or in electric oven until pliable. Shape by hand as shown. If desired a template of wood or metal may be used in shaping.

CONTINUITY TESTER

WILLIAM M. WANGEL
Brooklyn, N. Y.

The continuity tester shown and described in this article is a project that will acquaint the student with the principle, parts, and circuit necessary for such an electrical device. Its design makes it particularly well adapted for testing fuses.

Materials

1. Wood base 1⅜ by 2⅞ by 4⅜
2. Base cover of 1/16 aluminum 2⅞ by 4⅜
3. Miniature pony-cleat receptacle
4. Miniature bulb of 1.5 volts
5. Two phone jacks
6. Two double ended fahnstock clips 1½ in. long
7. Three insulated phone-jack tips
8. One insulated alligator clip
9. Four rubber bumpers ½ in. diameter
10. Two No. C dry cells
11. Two pieces of test lead wire, 10 in. long
12. Two No. 6 by 1⅛-in. brass wood screws
13. Two No. 6 by ¼-in. wood screws
14. Piece of 1/16 aluminum 2⅝ by 3⅞
15. Eight inches of No. 19 enameled wire
16. Paint

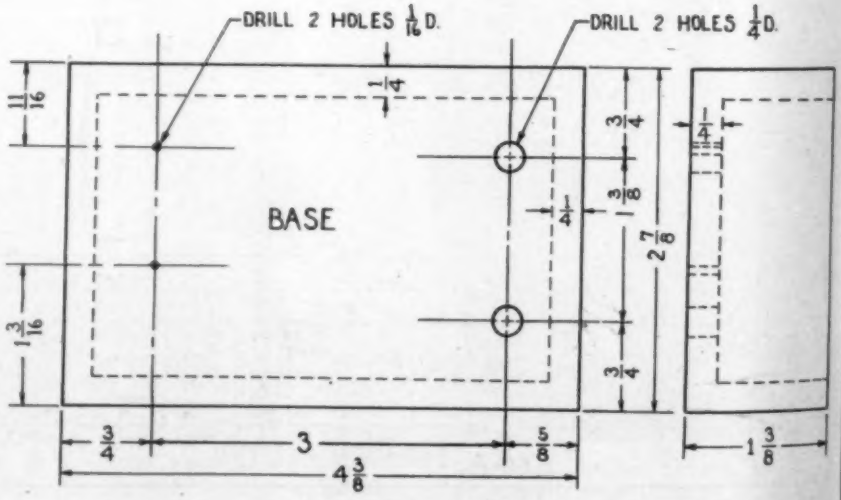


Fig. 1. Continuity tester

Procedure

1. Base
   a) Procure wood for base and cut to size 1⅜ by 2⅞ by 4⅜.
   b) Rout out indicated portion with a Forstner bit.
   c) Drill indicated holes.
   d) Paint base.
2. Contacts
   a) Cut out the two contacts from the piece of aluminum 2⅝ by 3⅞ as indicated in sketch.
   b) Drill indicated holes.
   c) Fold flap up to 90 deg. along indicated line.
3. Leads
   a) Attach an insulated phone-jack tip to each end of one test lead wire.
   b) Attach an insulated phone-jack tip and an insulated alligator clip to the ends of a second test lead wire.

Fig. 3. The assembled continuity tester

4. Assembly.
   a) Attach contacts to the base at one end with phone jacks.
   b) Attach miniature pony-cleat receptacle to the other ends of the contacts with 1⅛-in. brass screws. Screws go through contacts on receptacle. One screw touches the contact. The other screw goes through the hole drilled in the contact without touching it.
   c) Connect two cells in series with wire. Place in hollowed out portion of base. Solder one lead to the screw which does not touch the contacts. The other lead from the cells is soldered to the phone jack on the same side as the previously mentioned screw.
   d) Screw aluminum cover over the bottom cavity. Rubber bumpers may be attached to the bottom.
   e) Attach double ended fahnstock clips along the edges of the base so that the test lead wires will be caught when inserted between them.

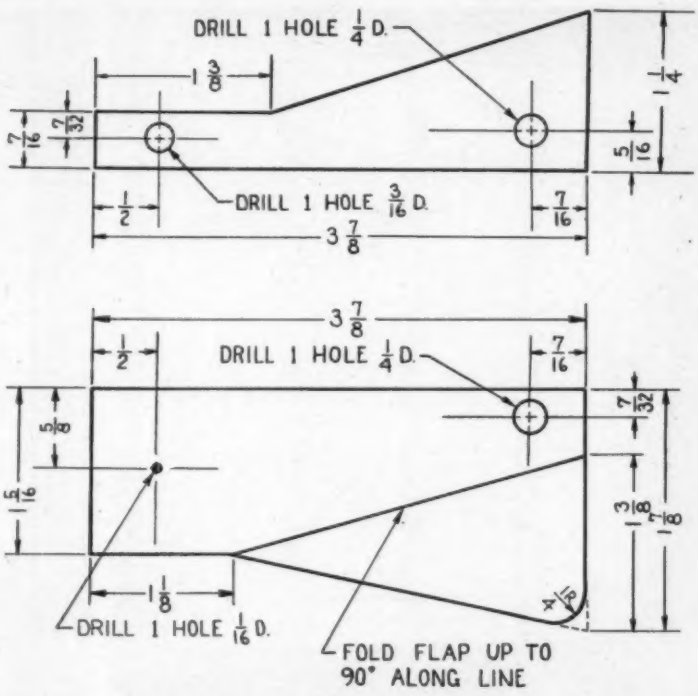


Fig. 2. Electrical contacts

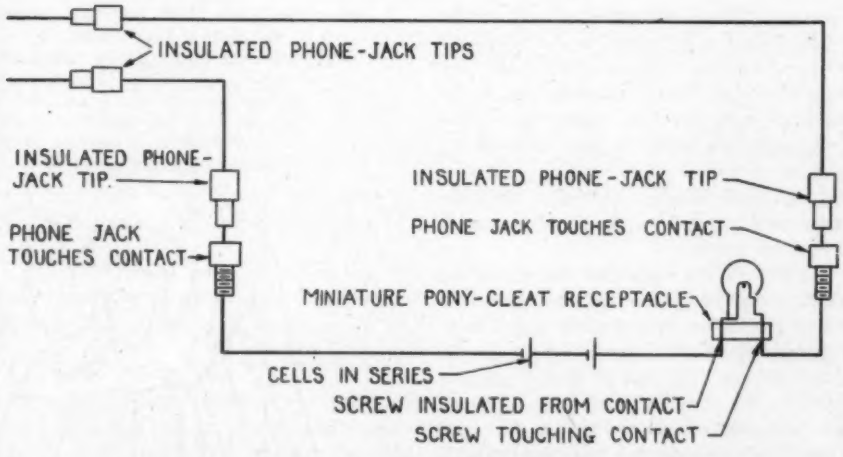


Fig. 4. The electrical diagram

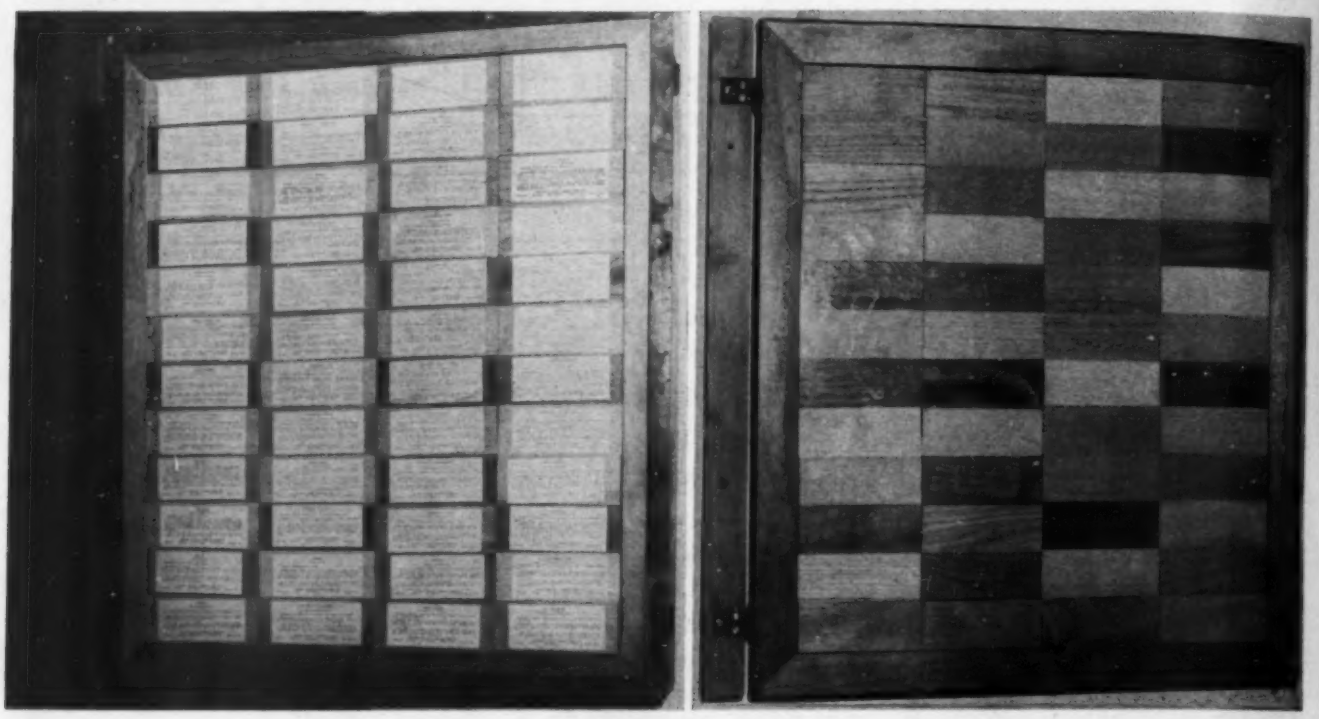
Fig. 5. Continuity tester in use

A VISUAL AID FOR THE WOODWORKING SHOP

ROBERT D. HOGAN

Kansas State Teachers College
Emporia, Kans.

The visual aid described and illustrated herewith is superior, so the writer thinks, to the *little box* of wood samples traditionally kept in the storeroom. The wood samples used for this visual aid were bought from the Paxton Lumber Company of Kansas City, Kans. A picture frame was made of mahogany



Wood samples

shorts and two grooves were cut in the frame to allow glass to be placed on both sides of the wood samples. A framework of one inch angle iron was welded together into which the wood frame fits. Two hinges were welded to the angle iron frame. A piece of wood was fastened to the concrete wall by means of lead expansion fasteners and bolts. Then the hinges were secured to the board by means of flathead screws.

Not only is this visual aid decorative and eye catching, but it can be used in testing and in connection with lectures and demonstrations. As the pictures show, it can be turned out from the wall by simply releasing the screen door latch. On the reverse side the user finds the complete story on the wood sample or samples he has had trouble identifying from the front. In shops where welding equipment is not available, the angle iron frame can be dispensed with. However, it does add strength.

FASCINATING COPPER TOOLING

RUTH SIMON
Fort Wayne, Ind.

Not only is copper tooling inexpensive and simple, but the results are so impressive that even a rank beginner can become fascinated with this art. Since no special tools are needed it is a hobby which can be carried on at home long after the shop project is finished.

The following materials will be needed:

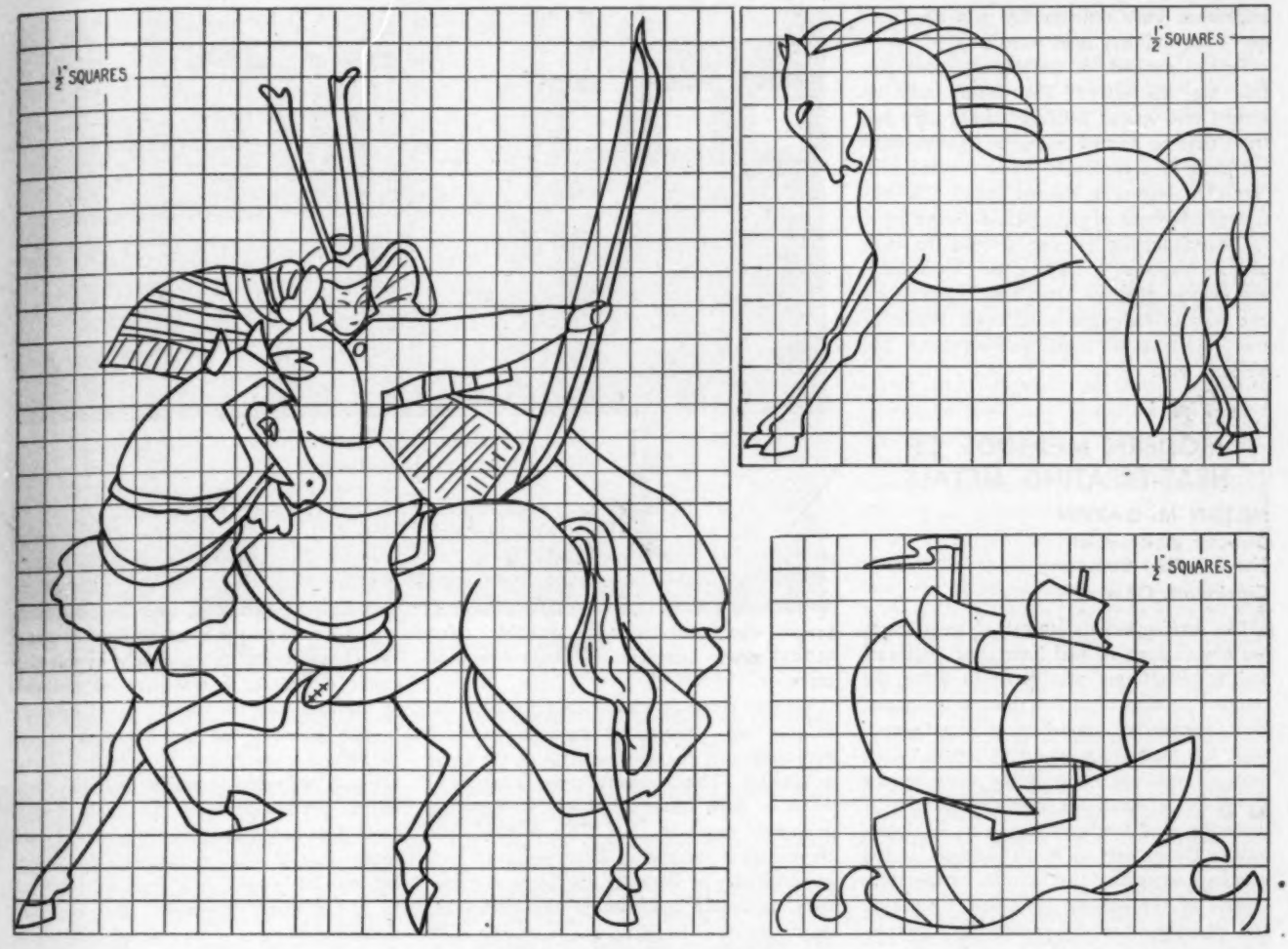
Copper foil — usually 25 cents per running foot, a foot wide, at craft stores
Orange sticks (standard manicure equipment) or, better yet, ¼-in. dowel sticks cut at a slant on one end and sharpened with a pencil sharpener on the other
Padding — felt, flannel, or an old dish towel
A hard working surface such as a table
Very fine steel wool
Clear lacquer (clear nail polish will do for a small project)
Liver of sulphur lumps (available at drug-store)
A filler — this may be canning paraffin, or battery wax, or plaster of Paris

Pattern for copper tooling

The next step is choosing the pattern. An excellent booklet put out by the Handcrafters, Waupun, Wis., called *Metal Modeling Handicraft*, and costing 55 cents, has not only excellent patterns but detailed instructions and suggested projects. Metal is also available from this company. However, the library and craft books will produce a myriad of suitable designs. Choose patterns with simple lines, although more experienced crafters may use more detail, such as in the Japanese warrior pattern.

Cut the copper the proper size with a pair of scissors. Fasten the pattern on the face of the metal with Scotch tape. Trace the pattern by pressing the lines lightly with a sharp pencil or sharp orange stick. Remove the pattern.

It is a good idea at this time to analyze the pattern and color the parts of the pattern



Patterns for copper tooling

which must be molded highest in the copper. Rough shading even in black and white is helpful to emphasize the billow of a sail, for instance. A sail must be molded higher than a mast, for example, and it is a good idea to get this clearly in mind before beginning. Mistakes are hard to rectify.

Place the copper, face up, on the padding. Go over all the lines with the sharp edge of the tool, using gentle pressure.

Place the picture, again face up, on the hard surface. Using the flat end of the tool, iron out the background with light even strokes. Push it out all the way to the edges.

Now it is ready for the real modeling.

Turn the copper face *down* on the padding. Press out *gently* the parts which are to be raised with small back and forth strokes of the flat end of the stick. Press out the side of the line which will be highest, the side which is the forward sail, for example. If both sides of the line are of equal importance press out on each side of the line. This will eventually give the line a deep accent. Go easily over the entire figure raising it only a little.

Turn the picture over face up on the hard surface and once more iron out the background.

Keep the edges of the molding sharp and clear as the lines deepen.

That is the basic technique — to push out from the back on a padded surface, and smooth down the background from the front, on a hard surface.

As the work progresses use thicker padding, which will make the modeling deeper, but *work slowly and gently*. The best padding for small details such as the face is a finger. It is simple to sketch features with the counter pressure of a finger on the back of the face. (Features may be painted on after the picture is lacquered.)

When the modeling is finished the background may be left as is or tapped with the flat end of the tool.

Now for the finishing of the picture. The first step is a light polishing with fine steel wool to remove finger marks.

The second step is oxidation, which may be done in one of two ways.

1. For a shiny picture with dark accent lines, dissolve a small lump of liver of sulphur in a half to one cup of hot water. Wind a bit of cotton around a toothpick and dip into the hot solution. Paint the cracks and edges of the figures in the picture. Smears will polish off.

2. For a rich burnished copper with dark background make a weak solution of liver of sulphur in an enamel pan or sink large enough to hold the picture. A 1-in. lump in five quarts of hot water is about right. Immerse the picture and soak until it is black. This will take about fifteen to thirty minutes. Drain on newspapers or towels.

The next step is filling in the back of the figure to protect it. Paraffin or battery wax can be melted and let harden to a mushy state and then spread in to fill the back. Or the indentations may be filled in with plaster of Paris. In this latter method it is usually necessary to glue in the plaster after it has hardened.

Now turn the picture face up and polish with steel wool, using gentle but brisk strokes until the picture has reached the desired

brightness. Then coat quickly with clear lacquer — or ordinary floor wax.

Several methods of framing a copper picture are satisfactory. The picture may be tacked with special nails on stained plywood. Or it may be framed in regular frames without glass, or a cardboard frame covered with "grass" wallpaper or colored burlap. The picture can be held in place with adhesive tape.

Copper tooling is not limited to wall plaques, however. It may be used to decorate any number of items, from door markers and box tops to elaborate lamp bases. Whatever the project, it will make an inexpensive and welcome gift.

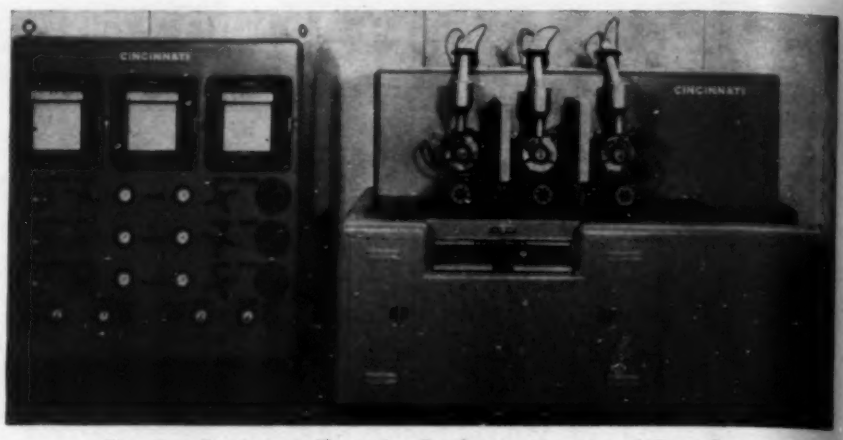


Fig. 1. Cincinnati Flamatic. Produces one set of Dynaflow cams in 15 seconds

MODERN METHODS OF HEAT-TREATING METALS

MILTON M. GARVIN
Director of Research
The Schaible Company
Cincinnati, Ohio

The surface heat-treatment of metal parts has always been of real interest to engineers and manufacturers who have to solve the complex problem of correct thermal treatment. Heat engineering applied in a metallurgical sense has made very important strides in the past ten years as more of the facts become known and as means are developed chemically, thermally, and mechanically to more closely control the process of heat-treatment. It has long been recognized that accurate temperature control of the heating cycle and much skill and experience are still necessary to successfully heat-treat parts. These conditions quite obviously imposed limitations in the mechanical design of parts and thus in the function of the mechanisms themselves, and it is only natural that the thoughts of metallurgical engineers should turn to a study of high speed applications of heat to confined areas requiring hardness.

It has now come about that we have seen machines parallel the design of machine tools employing electrical and gaseous energy to impart intense heat in short intervals of time to localized areas of components requiring hardness only in selected portions, such as gear teeth. Over half a century ago the use of acetylene and oxygen suggested itself as a natural medium, but the crudity of application in a mechanical sense resulted in uncontrolled heat and lack of uniformity. The high cost of developing sources of this high temperature fuel placed definite limits on its use. For the same mechanical reasons the use of natural gas and later butane-propane gases suffered the same fate of limited applications.

Although the economy of natural gas was recognized, there was then a lack of surface hardening machines employing it as a fuel. Recently a few manufacturers have invaded this field of hardening and machines are being properly and gainfully employed on high production work with reasonable success.

With the advent of machine tool manufacturers into the field of surface hardening, proper equipment is now available using natural gases, acetylene and butane-propane gases.

We may correctly assume that it is practical to use high temperature gases for surface hardening only if proper control of the cycle is possible. This is many times impractical where a fixed quantity of gas is delivered in a fixed space of time. This is called the chronological method and can result in lack of uniformity of work because other variables such as surface condition of the workpieces may vary in a lot. In some cases the cycle that a small workpiece is exposed is only of 2 or 3 seconds' duration and the surface of the part must have its temperature increased at the rate of 500 deg. F. per second. Proper results here would be doubtful.

Selective surface hardening with high temperature flames or high frequency electrical energy involves two basics: to control within very narrow limits the exact temperature to which the area is heated and to control the area to which the energy is to be confined. To maintain the desired hardness pattern, the heat cycle must be rapid — usually a matter of seconds. Thus the need for temperature control is important when selective surface hardening.

Recognizing this problem, the metallurgical engineering staff of the Cincinnati Milling Machine Company developed the Flamatic hardening machine with intense high temperature flames and electronic control of the workpiece surface temperature. Thus, the one element that should not vary — surface temperature — is accurately measured and controlled for one workpiece or for thousands. The Flamatic machine achieves this by measuring radiation, since this is always directly proportional to the true temperature of the workpiece surface being heated and exposed to a sensitive thermopile being kept in proper focus. Thus the work is continuously and instantaneously controlled through the radiant energy emitted. This instrumentation is so accurate on the Flamatic that the human eye cannot report it as closely as this electronic device for a few parts or thousands as the case may be. Uniformity of hardening is now possible and gas hardening as well as induction hardening by electrical energy are now beginning to realize their full potential as production tools, similar to machine tools. This new concept of temperature control means that production machines for hardening can be placed in a line and parts can enjoy continuous movement rather than intermittent movement to an isolated heat-treating department as is usually the case.

It is now possible to apply localized hardening to many parts with the proper selection of materials that will result in less mechanical distortion and lower heat-treatment cost. Costly corrective machine operations on the workpiece in the hardened state can now be avoided and higher production has been the rule with the newer method. It has in most instances resulted in a lower capital investment, less labor, lower maintenance costs, and comparatively small shop area requirements.

Operating costs are reduced to many instances because fuel is used only to heat-treat a portion of the surface of the work, due to the ease of handling the parts and in some instances a less expensive grade of steel can be substituted for the part. Since the distortion by this means of hardening is usually materially less than by previous furnace methods a large savings results in elimination of corrective operations. Sometimes this is substantial and with reduction of scrap inherent in the localized heat-treating method the savings here alone are sometimes more than the entire prior heat-treatment costs. This was true in the case of one automotive

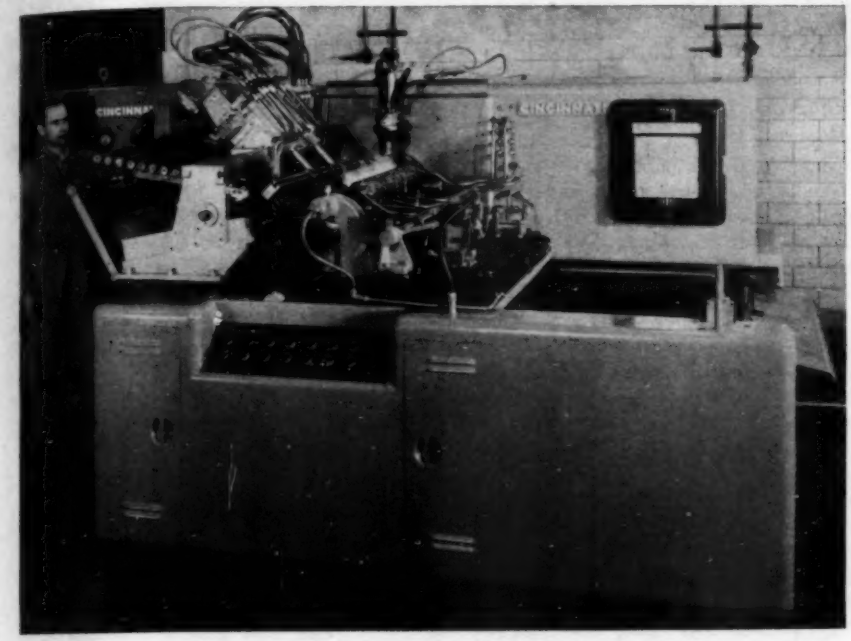


Fig. 2. Automatic camshaft hardener

manufacturer employing controlled flame hardening of camshafts in which the savings in grinding time of the now uniformly hardened parts more than paid for the heat-treating costs.

Certain variables are still involved in selective surface hardening with flames, but these are now better understood and controlled. The depth of hardened case depends upon the type of gas used, the pressure of the fuel gas and oxygen or air, the distance between the flame heads and the workpiece, the speed of rotation if the work is spun or the linear speed and/or the distance of the flame head if the work is progressively hardened. The time of delay before the work enters the quenching medium, the pressure of the quenching media if the part is forced quenched, the temperature of the quench and the nature of the quenching material are other controlled factors in this new process.

These factors, except surface temperature, can be varied and controlled in combinations to give the exact surface heat-treatment desired. Provisions are made in machines manufactured for surface hardening by The Cincinnati Milling Machine Company, Gleason Company, The Selas Corporation, The Stearns-Rogers Company, Hydraulic Machinery Company, and The Gas Appliance Service Company, to control most of these afore-mentioned variables in practice of production flame hardening in industry. The most notable advance in the art of flame hardening to the science of controlled flame hardening was made with the utilization of accurate temperature control on the Cincinnati Flamatic. This machine is employed with marked success in the surface heat-treatment of automotive gears, camshafts and numerous other parts including complex parts in automatic transmissions.

The types of gases employed in selective surface hardening are usually: acetylene-oxygen propane-oxygen, propane-air, natural gas-air, or natural gas-oxygen-air. Each is used to fill a special need or at times can be used interchangeably depending on the depth of case desired or the geometry of the part being hardened. The acetylene gas can achieve flame temperatures up to 6000 deg. F., but is usually used in the range of 5200 to 5800 deg. F. The gas required under normal conditions to heat-treat one square inch of steel to a depth of one eighth inch is 0.01 cubic foot of gas, depending of course on surface condition and other variables imposed. When propane is used as a fuel gas, it is mixed with oxygen in the ratio: 1 to 2½ volumes or more depending upon the results desired. Propane has a higher heat value than acetylene, but provides a lower flame temperature because it must be mixed with more oxygen to achieve fast surface hardening.

Flame temperatures accomplished by propane-oxygen mixtures vary, depending upon the ratios used, but normally 4500 to 5000 deg. F., is considered good practice. The availability of propane is increasing and the future use of propane in surface heat-treating is assured because of its low cost and high fuel value. It is currently employed as a fuel in buses in several principal cities because it is in excess of 100 octane rating and results in less motor damage than gasoline engines of comparable use.

Flame temperatures of natural gas are usually lower, on the order of 2800 to 3500 deg. F., due largely to the mechanics of burners employed and the high ratio of air that must be used resulting in lower flame temperature. Much use is being made of natural gas because of the economy and a brighter future is in store when it can be properly used with oxygen enriched mixtures. Nearly five thousand flame hardening machines are in active use in this country in production lines and many more will be employed when machine tool manufacturers shift some of their excellent mechanical talent and facilities into the manufacture of mechanized means of selective surface heat-treatment. A bright future remains when the wedlock of machine tools and heat-treating machines is consummated.

Any type of hardenable carbon or alloy steel, including some stainless steels and cast iron, can be flame hardened. Fine grain steel with a carbon content of from 0.25 to 0.90 per cent generally produce the best results with this method of hardening. Parts to be hardened should be clean and free from scale to prevent the formation of soft spots. Hardness of as high as 62 R_c has been obtained in flame hardening Meehanite castings, compared to 50–55 R_c obtained by previous furnace methods. Optimum hardness can be produced on specified surfaces of the part without affecting the core. Below this hardened surface is a transition zone where the hardness is gradually reduced until the original core hardness is reached. By adjusting the rate of heat input, the depth of fully hard and transition zones can be varied.

It is important, from a metallurgical standpoint, to note that, by this method, between the hard and soft zones no band exists which is softer than the base metal. Since the flames can be directed to localized areas, usually any surfaces on the part can be selectively hardened. Minimum scaling and no pitting are encountered with this process, and any single discoloration can be removed by sandblasting.

Dynaflow cam used in the automatic transmission of the Buick Motor Car, has internal recesses, the inclined cam surfaces of which must be hardened while leaving the adjacent areas soft. Hardness must be sufficient to withstand the high pressure of overriding clutch rollers, but holes drilled at right angles near the lobes require high ductility to prevent cracking. Formerly, these rings were hardened on three selective surface hardening machines powered by electricity. With two men operating these machines a production of 67 rings per hour were achieved. This was far below the amount required. The Cincinnati Flamatic machine, Figure 1, was designed for

this job and will produce 10 to 20 cams per minute with one operator and virtually no rejects. The automatic flame hardener for camshafts, Figure 2, will produce one automotive camshaft every 30 seconds and one operator serves three machines.

These shafts are made of high alloy cast iron, sandblasted, centered, straightened and then flame hardened before being machined. A ⅛-in. case hardness Rockwell — "C" 55 is produced around the periphery of the 12 cams and eccentric of the shaft. The four bearings and helical gears are left soft for subsequent machining. The metallurgical structure of the hardened iron is uniform, the only difference being caused by variations in the combined carbon and alloy content of the iron. Distortion is at a minimum after selective surface hardening. This is selective surface hardening with high temperature flames highly mechanized, built to the high standard of machine tool quality.

It is evident from the previous analysis that the use of high temperature flames as a method of selective hardening is becoming an important factor in the heat-treating industry. The subsequent reduction of costs and increased production obtained with this method are reasons enough for this trend, and the ability to produce a better product without a large number of rejects or additional machining will clinch the case for selective surface hardening with high temperature gas flames under controlled conditions made possible by modern machines.

SIMPLE ANDIRONS

LUDWIG KASAL
Bronxville, N. Y.

The andirons described here are simple to make. The scroll is practical as it provides a place to hook a poker.

Today many small homes and apartments boast of a small fireplace. It is difficult to find andirons small enough to fit. This set should fill the requirement nicely.

Andirons which are inexpensive are desirable in summer cabins where winter corrosion and theft are likely.

The ornamental spheres are old brass door knobs which may be found in the cellar or at the junk yard.

This project involves no difficult operations and is well suited for the junior high school shop, camp shop, or leisure time adult class.

Tools

Bending jig for scrolls, heavy cross-peen hammer, 3/16-in. drill and tap drill for ½-in. tap n.c., or n.f., heavy duty vise and anvil, rivet set and yard stick, ½-in. tap and tap wrench, hack saw, and scriber.

BILL OF MATERIALS

Part	*No. of pcs.*	*Material*	*Size*
A	2	Strap iron	¾ x 3/16 x 28 in.
B	2	Strap iron	½ x ½ x 17 in.
C	2	Strap iron	½ x ¼ x 12 in.
D	2	Brass door knobs	2 in.
E	8	R.h. black iron rivets	¾ x 3/16
F	2	Stud bolt n.f. or n.c. thread	½ in.

Procedure

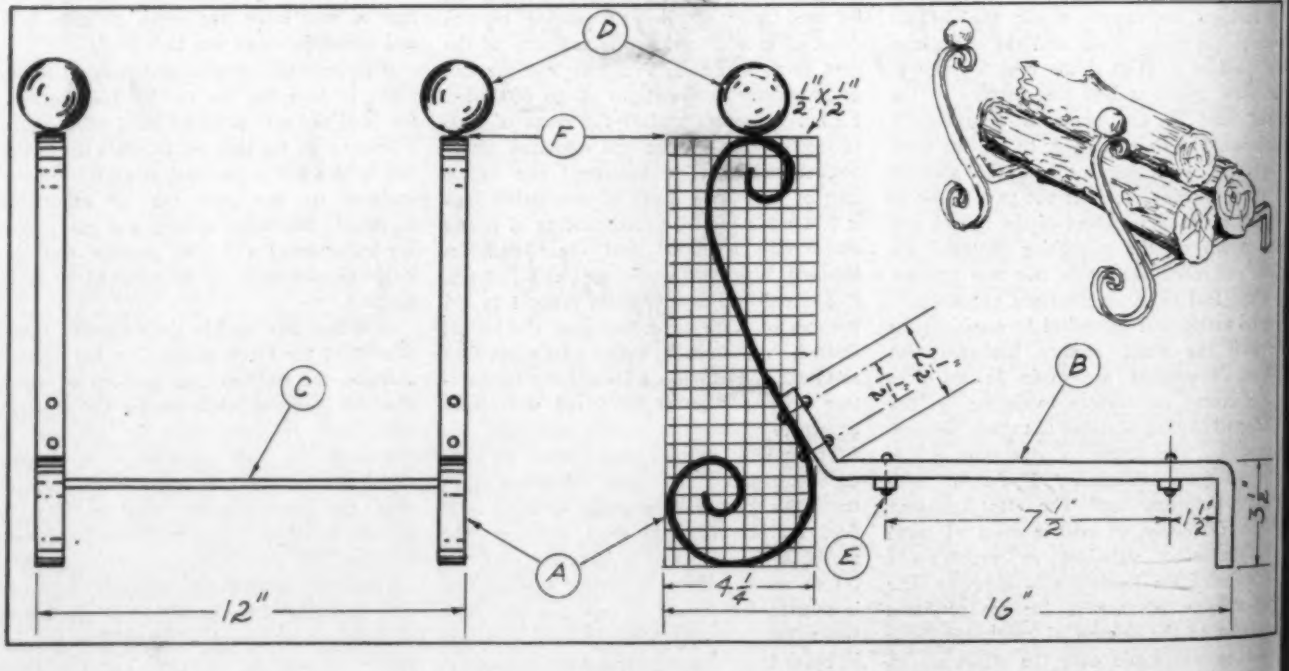
1. Lay out the scroll by drawing the square on a large sheet of paper and transfer the points where the curves meet the lines.
2. Cut the material to the lengths required.
3. Bend the scrolls in the jig, checking the curves with the pattern.
4. Bend the legs in a vise to obtain square corners.
5. Bore and tap the holes for the spheres.
6. Lay out and punch for rivet holes.
7. Bore rivet holes in scrolls using the mating holes for a guide.
8. Cut a section of a bolt to provide a stud and join the spheres to the scroll.
9. Assemble by riveting and paint with a coating of flat black.

NOMOGRAPH FOR DETERMINING BOARD FEET

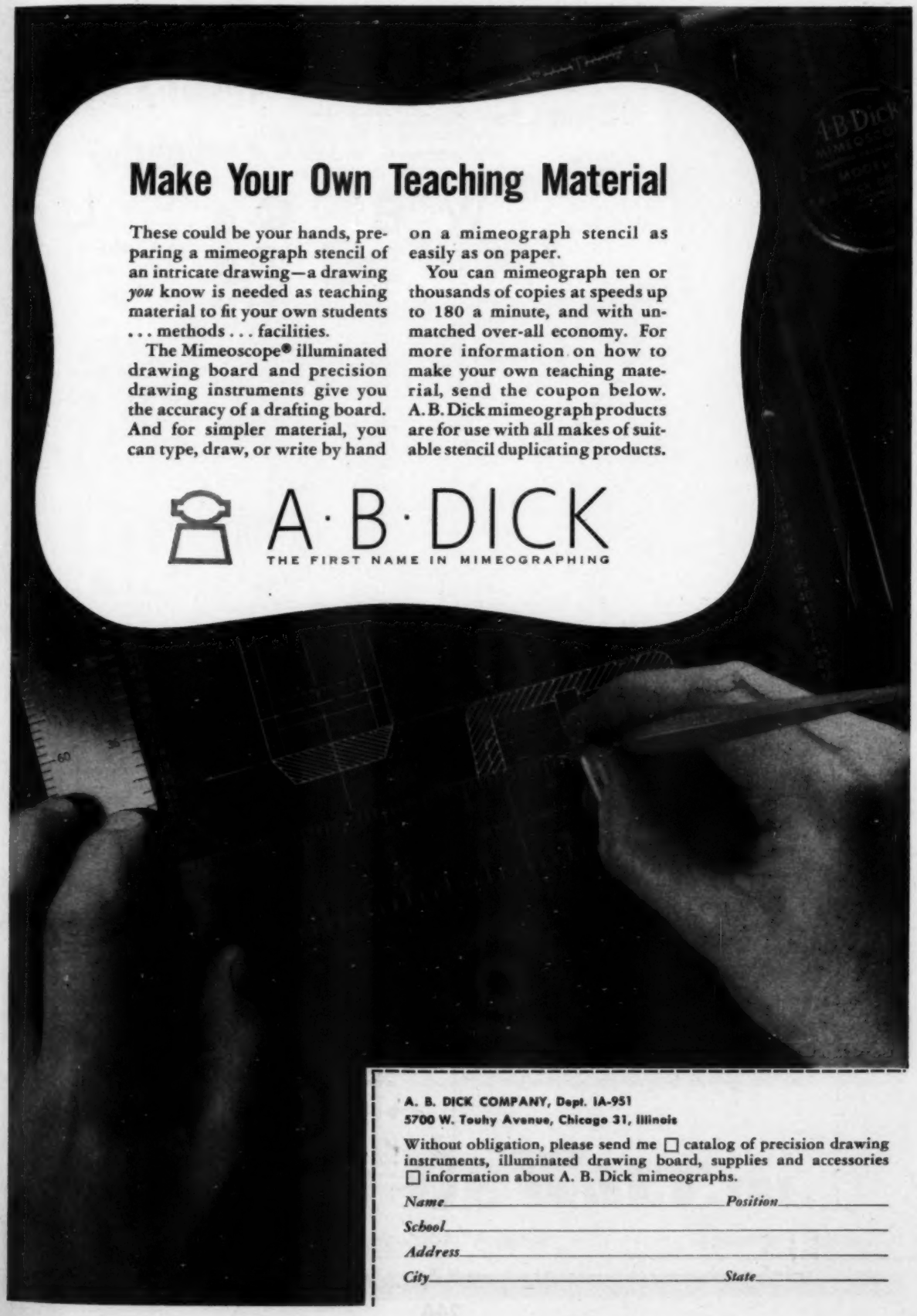
JAMES H. BROWN
Assistant Professor
University of Omaha
Omaha, Neb.

To find the number of board feet contained in a piece of stock 2 in. thick, 10 in. wide, and 3 ft. long, locate the point on scale W corresponding to a width of 10 in., and the point on scale L which represents a length of 36 in. Connect these points with a straight edge and mark the point of intersection where the straight edge crosses the Q scale.

(Continued on page 24A)



Simple andirons



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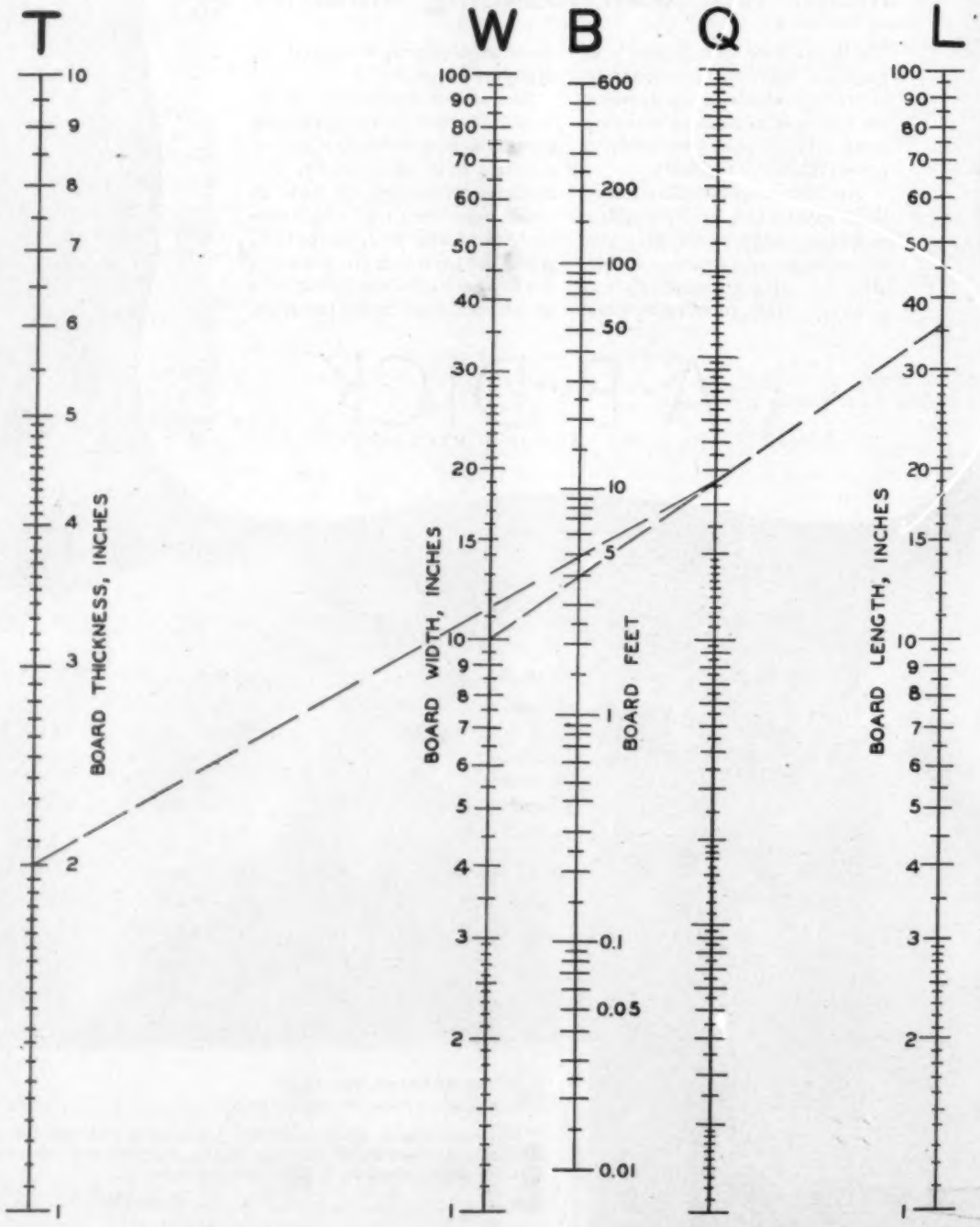
NOMOGRAPH

FOR DETERMINING BOARD FEET

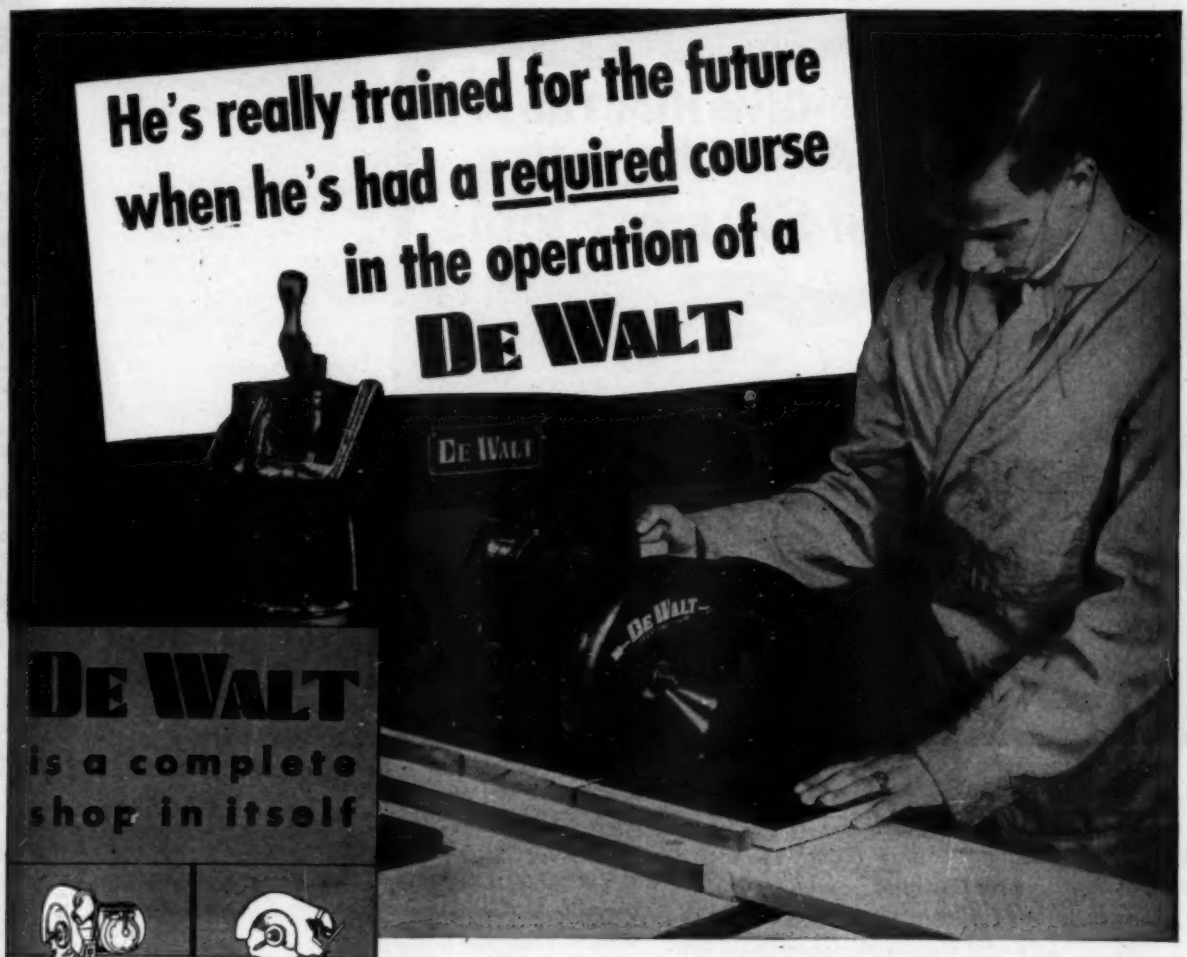
EQUATION: $B = \frac{T \cdot W \cdot L}{144} = .00694 \cdot T \cdot W \cdot L$

WHERE — B = BOARD FEET
T = THICKNESS IN INCHES
W = WIDTH IN INCHES
L = LENGTH IN INCHES



Nomograph arranged by James H. Brown (See pages 302 and 26A)

He's really trained for the future when he's had a required course in the operation of a DE WALT



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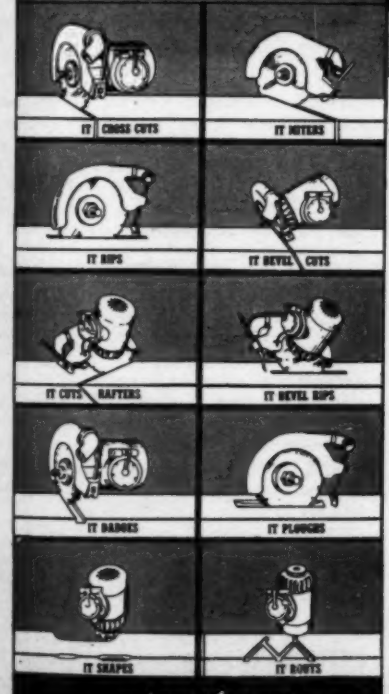

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NOMOGRAPH

(Continued from page 24A)

Move and align the straight edge with the predetermined point on the Q scale and the point on the T scale which represents a thickness of 2 in.

The point of intersection with the straight edge and the B scale represents the number of board feet contained in the piece of stock — in this case five.

Questions and Answers

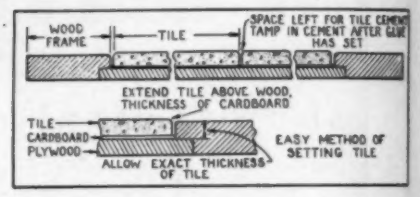
SETTING THE TILE FOR A TABLE TOP

1148. *Q.:* A job order came to our shop recently to make two coffee tables, the tops of which are to be of Mexican tea tile set in an ornamental iron frame. The tiles are of a reddish clay and of varying shapes and sizes with a design or pattern glazed over. The edges are not exactly square or straight and the tiles seem to be warped or cupped. One would suppose the tiles would be set with some kind of plastic cement upon a wood base.

Due to lack of experience or knowledge in working with tile of this type, I would like to know the correct procedure and the proper materials (particularly the cement) to use in doing a job of this kind. Would also like to know where the materials can be secured or bought. — *W. J. J.*

A.: I would refer you to an article published in the September, 1940, issue of INDUSTRIAL ARTS AND VOCATIONAL VOCATION,* in which the question that you raise was answered very well indeed. I am sending you a penciled tracing of the sketch that went with the description of how to set tiles. The author of that article is Jesse E. Rathbun, and the accompanying sketch will be made plainer by the following paragraphs:

Make the frame as usual, allowing sufficient space for the plaster cracks (¼ to 5/16 of an inch width). Place a piece of cardboard beneath the tiles and then glue the tiles to this cardboard. Many people desire that the tiles extend slightly above the wood enclosing them. The cardboard filler takes care of this as shown in the sketch. It is well also to glue the cardboard filler to the plywood bottom of the table top and then glue the tile to this cardboard filler. Any good grade of glue will be satisfactory. Probably it would be best to use waterproof glue.



Setting tile for a table top

To fill the space left between the tiles, tamp in slightly moistened cement after the glue has set.

An ornamental iron end or side table is described on pages 82–86 of the February, 1939, issue of our magazine.* It was very well illustrated, and I believe you can adapt the wood base for your tiles shown in the sketch to your particular needs.

The glue can be obtained at any hardware store and the cement for filling up the spaces between the tiles can be bought at any building supply store where cement for making concrete foundations is sold.

For straightening up the edges of the tile you might use a hack saw, and for leveling up the warped or cupped tiles you might use some hardwood sawdust mixed with the same kind of glue that is used for fastening the tiles to the cardboard base, to form a bedding on which the tiles are to rest. — *J. J. M.*

*Probably readers can look this up in the library of their school superintendents, or in the high school library, where back copies of our magazine may be kept. We cannot supply it because this article is out of print.

The average car consumes about 8,000 gallons of gasoline in its lifetime, and, at present rates, its owner will pay the state and Federal governments about $525 in taxes on that gasoline. — *Petroleum Newsnotes.*

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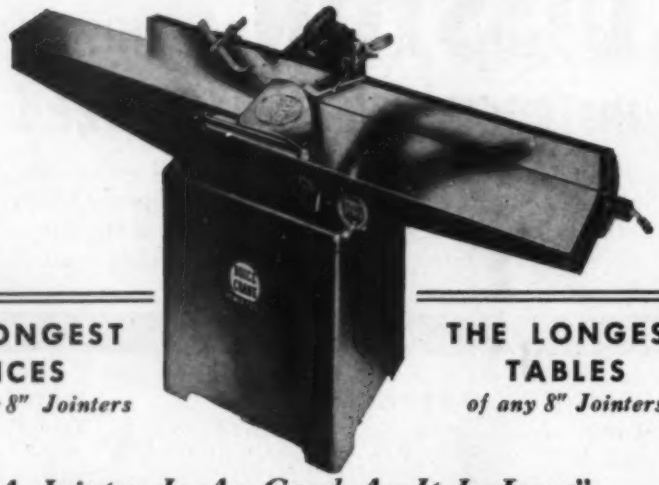

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Both tables are simultaneously ground flat and parallel to closest limits.

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3¼-inch diameter head (3⅛-inch cutting circle), 20% larger than conventional 6-inch jointers.

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Model No.	Size	Without auxiliary feeding aids, recommended for stock length to	Length being a factor recommended for timber sizes to	Planes boards and panels to
3400	8" x 84"	16 ft.	8" x 8"	16" wide
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ASSOCIATION NEWS

(Continued from page 6A)

first vice-president, Merrill C. Hamburg, supervisor of industrial arts, Detroit Public Schools, Detroit, Mich.; vice-president (Teacher Education), Willis H. Wagner, department of industrial arts, Iowa State Teachers College, Cedar Falls, Iowa; vice-president (Classroom Teachers), C. Merrill Hamilton, instructor of industrial arts, Raleigh, N. C.

VIRGINIA INDUSTRIAL EDUCATION CLUBS MEET

The first Virginia Statewide Industrial Education Clubs Banquet was held in Richmond on April 7, 1951. The attendance of 284 industrial educators and their guests from all sections of the state was most encouraging. Senator E. O. McCue, Jr., from Charlottesville, presented a very inspiring and informative speech on "Virginia's Industrial Education Needs." Other speakers included Dr. Dowell J. Howard, state superintendent of public instruction, and Dr. B. H. Van Oot, state supervisor of trade and industrial education.

The various state industrial education clubs were represented by Joseph A. Schad, professor of industrial-arts education at V.P.I.; John Leete, who gave the invocation, and by the following club presidents: Paul K. Plott, Industrial Arts Club at V.P.I.; John W. Joyce, Peninsula Industrial Education Club; Walter J. Dowling, Northern Virginia Industrial Education Club; E. B. Congdon, Southside Industrial Education Club; Bruce Neill, Richmond Area Industrial Education Club; McClelland Gray, Central Virginia Vocational Education Club; Joseph Lazaretti, Tidewater Industrial Education Club; and Joseph Thaxton, Blue Ridge Industrial Education Club. — *George L. Sandvig.*

INDUSTRIAL AND TECHNICAL TEACHERS MEET AT NEW YORK

The second annual professional conference for teachers of industrial and technical education was held July 10 to 12 at the New York State School of Industrial and Labor Relations at Cornell University.

Co-operating with the Cornell school in arranging the program was Dr. Arthur K. Getman, assistant commissioner for vocational education of the New York State Education Department.

Major topics discussed included the improvement of trade and technical instruction, bettering public relations between industry and school, trends in industrial education, and basic needs in vocational education.

In addition to talks by directors of vocational education, principals, and supervisors of vocational schools in New York State, the conference featured out-of-state leaders in the field.

John A. McCarthy, assistant commissioner of education in New Jersey, gave two addresses. His first talk dealt with trends in industrial education in the North Atlantic Region. His second took up the organization and instruction for apprenticeship and occupational extension classes.

Other guest speakers included John J. Seidel, director of vocational education in Maryland, and C. Frederick Pertsch, associate superintendent of schools in New York City.

ASSOCIATION NEWS

(Continued from previous page)

The conference is a part of the over-all industrial education program which the Cornell School of Industrial and Labor Relations conducts in addition to the regular summer session.

39th NATIONAL SAFETY CONGRESS

The 39th National Safety Congress and Exposition, will be held October 8–12, at Chicago, Ill. Sessions on industrial safety are scheduled for Stevens, Palmer House, Congress, and Morrison hotels; traffic safety sessions at Congress hotel; commercial vehicle and farm safety sessions at La Salle hotel; school safety sessions at Morrison hotel; and home safety sessions at Stevens hotel. For further information write R. L. Forney, general secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

THE SEVENTH ANNUAL OKLAHOMA STATE INDUSTRIAL-ARTS CLINIC

This clinic was held at the Student Union, Stillwater, Okla., May 28 to June 1 inclusive. Two lectures were scheduled for each day, one at 8:30 a.m., and one at 1:30 p.m.

Dr. Elroy W. Bollinger, Dr. DeWitt Hunt, Prof. C. L. Hill, Prof. L. H. Bengson, and Richard Kisner, did outstanding work in presenting the topics taken up at the clinic.

Among the subjects discussed were: Architectural and Service Features of School Shop Planning; Shop Organization and Equipment Layout; Replanning Existing School Shops; Individual Tools and Tool Boards; and Illustrative and Teaching Aids.

EPSILON PI TAU

Kappa Chapter of Epsilon Pi Tau fraternity at Chico State College, Chico, Calif., initiated eight new members on May 5, 1951. The installation took place at the Oaks Hotel in Chico followed by a banquet.

The eight neophytes included: George M. Anderson, Frank D. Cardoza, Thelbert F. Greene, Douglas L. Keith, Benjamin W. Matz, Clinton J. Patche, Jr., Leland M. Pearce, and Robert K. Peck.

Officers for the coming year were installed. They are: president, William E. Conley; vice-president, Ernest S. Massotty; secretary-treasurer, Gail J. Phares; corresponding secretary, Harvey H. Hanson.

♦ The Los Angeles County Industrial Education Association held their final meeting of the school year on Friday, May 11, at the Leuzinger High School. There were about 70 people in attendance.

Institute plans for the next school year call for a series of curriculum workshops to be held at the following places: 6:30 p.m., Thursday, October 18, 1951, El Monte High School, 712 S. Tyler Ave., El Monte; 7:30 p.m., Thursday, November 15, 1951, Centennial Intermediate School, 14320 S. Norwalk Blvd., Norwalk; 7:30 p.m., Friday, December 7, 1951, Morningside High School, 104th St. and Yukon Ave., Inglewood; 7:30 p.m.,

(Continued on next page)

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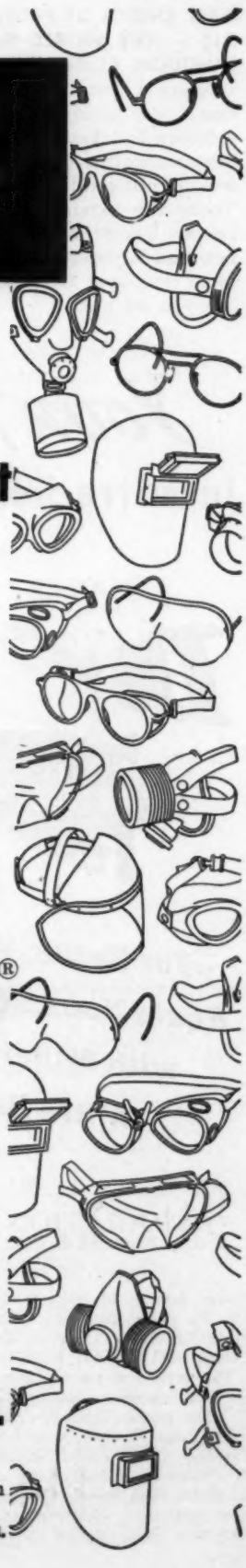

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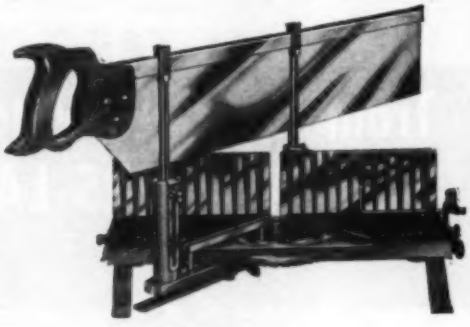

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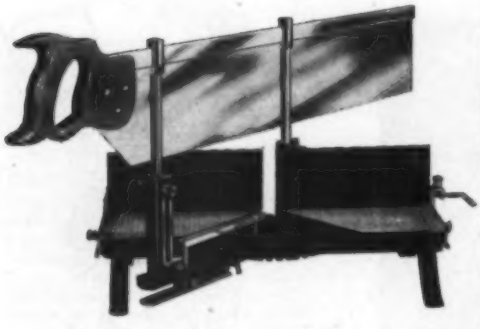

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ASSOCIATION NEWS

(Continued from previous page)

Friday, January 18, 1952, Whittier High School, 610 W. Philadelphia St., Whittier; 6:30 p.m., Friday, February 15, 1952, El Camino Junior College, 3031 Redondo Beach Blvd., Lawndale.

The sections of the workshops will be led by the following people: Industrial Arts Club, Russell C. Wiley, teacher, Inglewood High School; Woodwork, Ralph H. Bush, supervisor, industrial arts, Pasadena City Schools; General Metals, George W. Schneider, industrial-arts department head, El Monte High School; Drafting, Milo P. Johnson, supervisor, vocational and industrial arts education, Santa Monica City Schools; Machine Shop, Clifford G. Dobson, supervisor, Trade and Industrial Education, Burbank City Schools; Electricity and Radio, Horace W. Bates, special supervisor, Bureau of T. and I. Education, State Department of Education; Graphic Arts, Robert M. Schottland, teacher, Inglewood High School; Auto Shop, Edgar H. Wilson, director, vocational education, Compton Junior College.

Officers for the next year are: president, George W. Schneider, El Monte High School; vice-president, Joe Thomas, Leuzinger High School; secretary-treasurer, Horace Rees, Mountain View School.

♦ The Four-State Industrial Arts and Vocational Education Conference will be held at the Kansas State Teachers College, Pittsburg, Kans., on Friday and Saturday, October 26 and 27. The conference theme for this year is "Citizenship Through Industrial Arts and Vocational Education."

Featured speakers will be Professor Tom Hippaka of Iowa State College; Forest Rozell, secretary of the Arkansas Education Association, Little Rock; and Walter A. Bowers, executive director of the Magic Circle Industrial Council of Coffeyville, Kans. A complete program covering industrial arts, vocational industrial education, and distributive education has been developed, and a full range of exhibits will be on hand. Interested individuals from the four states of Arkansas, Kansas, Missouri, and Oklahoma, as well as those from other states, are invited.

♦ The Minnesota Vocational Association, which usually holds its convention in October, will join the American Vocational Association this year and the two organizations will hold a joint convention November 26 to December 1, 1951.

♦ The Young Farmers of Virginia, an "organization of, by and for Young Farmers participating in programs of organized, systematic instruction in vocational agriculture" was formed in Roanoke, Va., March 23 and 24 at a meeting of some 100 delegates from local Young Farmer associations.

Officers for the coming year are: John A. Cleaton, La Crosse, president; Joe Savage, Whaleyville, vice-president; J. Warren Good, Mt. Jackson, secretary; Waldo Dodson, Amelia, treasurer; F. R. Cole, advisor; and R. E. Base, executive secretary.

♦ The department of industrial-arts education at Miami University, Oxford, Ohio, held open house in connection with the annual conference of the Miami Valley Industrial Arts Association, on the university campus Saturday, April 14, 1951. The occasion provided an opportunity to inspect the recently completed unit of the departmental building program.

The industrial-arts education section of Gaskill Hall has been named the Fred C. Whitcomb Laboratories in honor of Dr. Whitcomb who was director of industrial education and practical arts education at Miami University for 35 years—1906–41.

The new facilities include a departmental library, two classrooms, an audio-visual education room, a research laboratory, a transportation and power laboratory, an arts and crafts laboratory, and three graphic arts laboratories—bookbinding and letterpress printing, planographic printing, and photography. The drafting and metalworking laboratories which are located in the central section of the industrial arts education building and which previously included graphic arts and transportation respectively are being enlarged and expanded.

The third unit in the departmental building program, which is still in the blueprint stage, will house an electrical communications laboratory, an elementary general metals laboratory, and a diversified activities laboratory for teacher education classes and for classes in the McGulley laboratory school.

All departmental facilities will be open to graduate and undergraduate students during the 1951 summer school session except those in communications and metalworking. — *William B. Stoner.*

Automotive taxes were the biggest money raiser for state governments last year, providing almost a third of all state tax revenues. — *Petroleum Newsnotes.*

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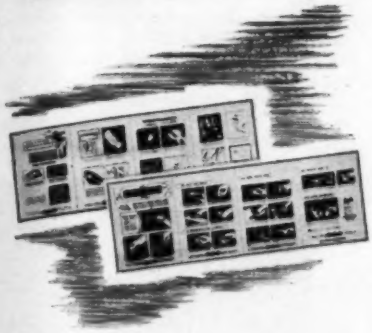
HOW MANY OF YOUR PUPILS KNOW THE REASON FOR DROP FORGING—AND WHAT IT DOES TO IMPART TOUGHNESS TO THE TOOL?



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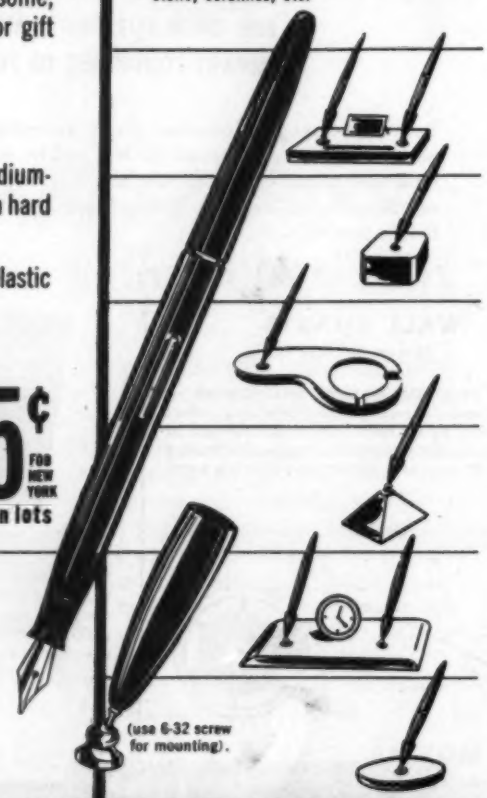

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Personal News

DR. BAWDEN RETIRES

Dr. William T. Bawden, formerly head of the department of industrial education, Kansas State Teachers College, Pittsburg, Kans., 1935–45, and later director of publications, retired from active duty on June 30, 1951, after completing 55 years of service since he began teaching in September, 1896.

In June, he completed the manuscript of *A History of Kansas State Teachers College, 1903–1941*, upon which he has been working during the past year. It will make a book of approximately 300 pages, which it is expected will be published by the College during the coming winter.

His permanent address will continue to be Kansas State Teachers College, Pittsburg, Kans., from which mail will be forwarded promptly. Dr. and Mrs. Bawden, the former Maude M. Firth, will make their home for the present in Tulsa, Okla., where Mrs. Bawden retired last year after completing 26 years as Director of Education for Home and Family Living in the city schools.

Dr. William T. Bawden

PROFESSOR TUSTISON RETIRES

Francis E. Tustison, professor of science and mathematics, after 32 years of teaching at The Stout Institute, Menomonie, Wis., retired at the end of the school year 1950–51.

He was born in Bucyrus, Ohio, and completed his studies in the grammar and high school there, and then attended Ohio Wesleyan.

Francis E. Tustison

He obtained his first position in Faribault, Minn., as director of physical education in the Shattuck Military Academy for the school year 1909–10. The following year he began teaching in Somerset, Ky., as instructor of physics and physical education in the local high school. Mr. Tustison remained there ten years.

In 1920 Mr. Tustison began his teaching career at The Stout Institute, and during his 32 years at that institution he has served under all three Stout presidents: L. D. Harvey, B. E. Nelson, and V. C. Fryklund. He has seen his department expand to meet the requirements of the four-year degree and later the master's degree as it became a part of Stout's graduate curriculum.

Professor Tustison has written numerous magazine articles, many of which have appeared in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Each article has been an individual effort, with the exception of an article written in collaboration with C. A. Bowman, dean of Stout's division of Industrial Education.

Among Mr. Tustison's books are *Job Sheets in Home Mechanics I and II, Forests, Trees,* and *Wood-Informational Units for Students in Woodworking,* and *Job Sheets for the Practical Electric Shop.* In collaboration with C. A. Bowman, *Lesson Plan, Job Sheets, and Graphic Aids;* and in collaboration with R. F. Kranzusch, *Metalwork Essentials.*

MISS ALMA LAIRD DIES

Miss Alma Laird, since 1946 assistant to the head of the secondary school department of D. Van Nostrand Company, Inc., died suddenly on June 6 in New York City.

(Continued on page 34A)

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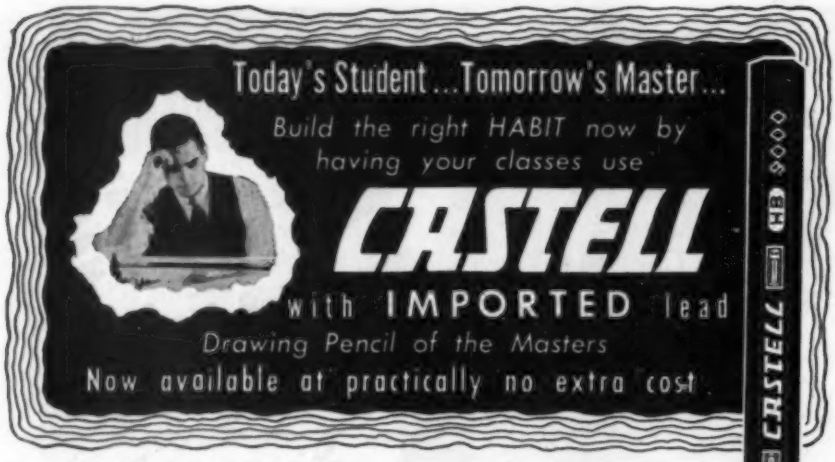
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PERSONAL NEWS

(Continued from page 32A)

For more than twenty years Miss Laird has been active in the field of educational publishing and during that time had become nationally known for her work in various capacities with several different publishers. Almost half of her publishing career, from 1936 until 1946, was spent with Charles E. Merrill Company in the sales promotion and editorial departments.

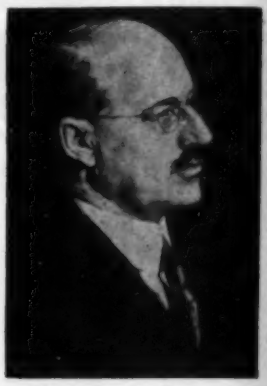
Five years ago she joined the newly created secondary school department at Van Nostrand Company, and soon achieved recognition throughout the country as an expert on vocational and industrial arts textbooks. She was widely known and respected by vocational and industrial-arts educators and will be missed by her many friends in these fields.

Miss Alma Laird

During the course of her career Miss Laird was a member of many associations in the secondary educational field, among them the American Vocational Association and The American Industrial Arts Association. Last year she was appointed a member of the Steering Committee of "The Ship."

FRANK PAXTON DIES

Frank Paxton, founder and former president of the Frank Paxton Lumber Company, Kansas City, Kans., died on Wednesday, May 16, 1951.



Frank Paxton

He was born June 10, 1887, in Independence, Mo. He attended the public schools in Independence, and the Virginia Military Institute at Lexington, Va.

He started business in the lumber mills in the state of Washington, and then became a lumber broker in Kansas City in 1911. In 1916 he organized the Frank Paxton Lumber Company and became its president.

Mr. Paxton is survived by his widow, three sons, and other relatives.

S. D. BAUMER APPOINTED VICE-PRESIDENT

S. D. Baumer has been appointed vice-president of the Airco Equipment Manufacturing Division, 60 East 42nd St., New York 17, N. Y.

♦ Dale McMurray, formerly of the Hutchinson, Kans., fire department, has been appointed state instructor of fire department training at the University of Kansas to replace Ronald Russell who has re-entered navy duty. The State Board for Vocational Education co-operates in this program with the State Firemen's Association.

♦ The board of directors of The Black & Decker Mfg. Co., Towson, Md., announce that Alonzo G. Decker, a cofounder of the company, has been elected president to succeed S. Duncan Black who died April 15.

Mr. Decker, 67, has been vice-president and general manager of the portable electric tool firm since he and Mr. Black started the company in 1910. He has devoted his efforts to the design and manufacturing phases of the business since its inception.

♦ Kenneth E. Oberholtzer, superintendent of the Denver public schools, and Alexander J. Stoddard, superintendent of schools in L

(Continued on page 37A)

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Dear Professor:

Early in February one of our good friends living in a college town wrote us for a reference to some treatise on drafting that would include something about the history of drawing instruments. A search failed to find anything at all satisfactory, but our interest was so aroused that we decided to see what could be compiled through a more extensive study. No one source yielded much information, but the collected material seemed worthy of putting into writing.

We have had it printed under the title, "HISTORICAL NOTE ON DRAWING INSTRUMENTS."

We are aware of the fact that some important details have been omitted. Such omissions are not due to oversight, but in some measure to lack of information. For example, we would like to know how Leonardo da Vinci and his contemporaries fastened a silver point to a compass; but a diligent search through various sources of information failed to reveal this. Answers to this question, or any other information that would lend interest to this paper, will be greatly appreciated and duly acknowledged.

Naturally, the writer of this paper has not neglected the opportunity afforded to say a good word for our own drawing instruments, but we believe that all of the historical material presented is correct.

A number of teachers have requested copies of this "Historical Note" for distribution to their classes in drafting as a means of stimulating interest in their work, and we are taking care of their needs. Should you also wish to have copies for similar use, we will be glad to supply them.

Yours very truly,

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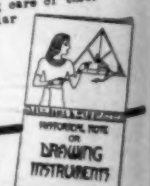

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PERSONAL NEWS

(Continued from page 34A)

Angeles, have been appointed to serve on the advisory board of the Fisher Body Craftsman's Guild.

Founded in 1930 by General Motors, the Fisher Body Craftsman's Guild is an organization devoted to the development of craftsmanship and creative ability among boys. In annual model car competitions, the Guild offers $65,000 in cash and other awards as an incentive to boys who design and build the best model automobiles.

♦ George F. Weber, director of industrial and vocational education at South Bend, Ind., retired recently. He was with the South Bend schools since 1919.

He served as a specialist in vocational education in Germany under the auspices of the Department of State last summer. Recently the Department of State has awarded him a grant to return to Germany for an extended period of time. He left with Mrs. Weber for Germany on June 13.

The executive committee of the Indiana Industrial Education Association held a reception for the two on June 2.

♦ Keith Sales has been appointed instructor of industrial arts at the high school in Vanoss, Okla.

♦ Leland B. Luchsinger has been appointed specialist in industrial preparatory training at the University of Texas, Austin, Tex.

♦ Peter Cooper, founder of tuition-free Cooper Union in 1859, himself a poor boy who could not afford an education, has been unanimously elected an honorary member of the Mechanical Engineering Fraternity, Pi Tau Sigma, its student officers announced yesterday.

Peter Cooper, who spent his youth as an apprentice to a carriage maker for $25 a year, finally became a millionaire businessman, inventor, and iron master. Throughout his life he described himself as "a mechanic of New York." When he was 63 years old, he founded Cooper Union as a free school where everyone, rich or poor, could come to learn.

The engineering fraternity membership scroll, signed by Cooper Union students Clarence J. Willis, president, and Henry Wolff, secretary, reads:

Pi Tau Sigma
Honorary Mechanical Engineering Fraternity
be it known by these persons that
Peter Cooper
has been properly elected by the
Cooper Union Pi Phi Chapter
and is hereby declared an honorary member of
Pi Tau Sigma Fraternity
1951

♦ E. W. Ristau has been appointed general manager of the Ohlen-Bishop Manufacturing Company of Columbus, Ohio. Ohlen-Bishop is a recently acquired subsidiary of the Rockwell Manufacturing Company, Pittsburgh, Pa. This firm produces a varied line of saws and saw blades, augmenting the products of Rockwell's Delta Power Tool Division.

♦ Nicholas J. Protoulis, whose home address is 14 Proussis St., Athens, Greece, joined the A.V.A. by sending his dues to the A.V.A. office.

♦ John F. Shea, formerly instructor of mathematics and machine drafting at the Chicopee High School, Chicopee, Mass., has been appointed associate director of vocational education for the State of Massachusetts.

♦ Jay R. Crowley, recently retired supervisor of the Bureau of Adult Education, New York State Education Department, is now assisting in part-time supervisory work in the bureau of occupational extension and industrial services.

♦ Ned H. Dearborn, president, National Safety Council, will serve as chairman of the board of judges of the 1951 National High School Driver Education Award Program of the Association of Casualty and Surety Companies, honoring various states for progress in training of youthful drivers as an effective method of reducing automobile accidents.

It was a popular machine tool as the Vernon Milling Machine even before SHELDON completely re-engineered and improved it.. added "Precision" Timken Tapered Roller Bearings; added a completely new variable speed type drive, increased the speed range and provided an optional power feed.

Quality-built throughout, in the modern SHELDON plant which was built and specially tooled to make fine precision machine tools, the modern SHELDON Milling Machine is truly "a better milling machine from every angle." Write for Catalog.

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POCKET SALT AND PEPPER SHAKER

U. D. WALKER
Industrial Arts Department
George Washington High School
Indianapolis, Ind.

A salt and pepper shaker for the pocket is a project which affords an opportunity to gain practice in some important machine tool operations and which requires a minimum of materials.

This project proves popular with students and provides practice in turning, drilling, bor-

(Continued on next page)

POCKET SALT AND PEPPER SHAKER

(Continued from previous page)

ing, cutting inside and outside threads, use of index head, milling, and polishing.

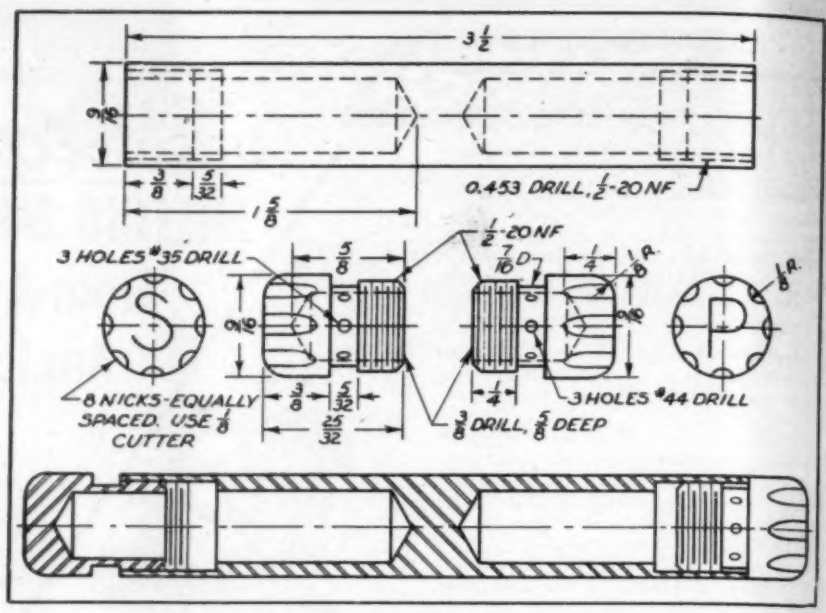
The preferable material is stainless steel, but aluminum or plastic also may be used.

Method of Procedure

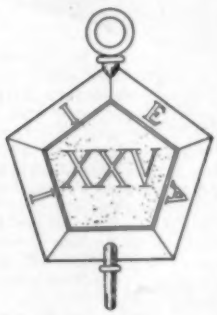
1. Place the stock for the body in a collet or chuck.
2. Face, center drill, and drill both ends.
3. Counterbore and cut threads.
4. Place stock for the caps in collet or chuck.
5. Face, center drill, and drill one cap.
6. Cut thread relief and cut threads on cap.
7. Cut off one cap.

Using the salt and pepper shaker

8. Repeat operations Nos. 5, 6, 7, for the other cap.
9. Assemble body and caps and place in collet.
10. Face and form radii on caps.
11. Place the assembled project in the chuck of index head on the milling machine.
12. Set up index head for 8 divisions and cut nicks in the caps.
13. Lay out and drill holes for salt and pepper.
14. Stamp letter S on salt cap and letter P on pepper cap.
15. Polish.



Pocket salt and pepper shaker



The twenty-five year club key

THE TWENTY-FIVE YEAR CLUB

LOWELL L. CARVER
Associate Professor
Department of Industrial Education
Iowa State College
Ames, Iowa

Prompted by the many inquiries received, an attempt has been made to give a brief explanatory sketch concerning the Twenty-Five Year Club of the Iowa Industrial Education Association. This club was organized for the purpose of recognizing Iowa teachers who had taught in the field of industrial education for 25 years or more.

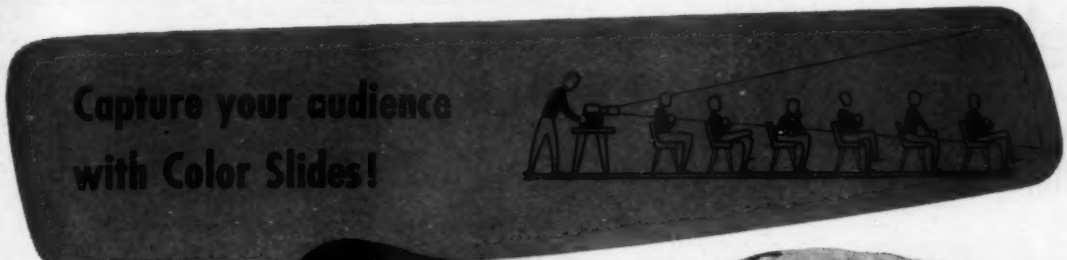
Each year at the fall meeting of the Iowa State Education Association, the Iowa Industrial Education Association holds its annual Fellowship Dinner. This has evolved itself into a Thursday evening affair, an opener as it were, for the week end of meetings. The main purpose of this gathering is to receive new members into the Twenty-Five Year Club, and provide an evening of fellowship.

The germ that produced the quarter century club was undoubtedly nurtured and developed by all members of the organization. Harry Carmichael, R. M. Hammes, William Mayo, and Ross Cramlet were the most persistent of those involved. The Twenty-Five Year Club originated at the Friday noon Industrial Arts Luncheon meeting, held in the Hotel Savery during the 1936 Iowa State Teachers Convention. The coterie was set up for the purpose of giving recognition to industrial education men who had rendered 25 or more years of teaching service in this field. At the first meeting P. G. Frasier, acting as master of ceremonies, introduced the following men who had the necessary qualifications for membership: Charles H. Bailey, Cedar Falls; Ferdinand Daehler, Boone; R. C. Woolman, Des Moines; Clark Brown, Muscatine; F. B. Hathaway, Mason City; John Bice, Fort Dodge; Henry Anderson, Des Moines; William Phares, Fort Dodge; C. A. Gessel, Davenport; O. E. Hauge, Marshalltown; J. LeRoy Jones, Des Moines; F. E. Hiler, Oskaloosa; W. C. Wood, Davenport.

When these men were introduced they were called on to give brief high lights of their experiences. Each man recalled facts covering the "early days" of industrial-arts shop equipment, teaching methods, class sizes, and project materials. The stories told were very appropriate and enlightening to the younger men and in retrospect provided fond memories for others. A ceremony of initiation was conducted following which these men were tagged with a ribbon, designating their status. They were then presented with special prizes to commemorate long and faithful service to the industrial education program.

The following year Harry Carmichael and Clark Brown were appointed to head up a committee to investigate the possibility of giving an award, but it was not until 1939 that Mr. Heston of Heston-Anderson Company, Fairfield, Iowa, became interested in the project and offered to provide honor keys to the club. He continued to do this until his death. It is gratifying to note that while the management of the company has changed, the

(Continued on page 40A)



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THE TWENTY-FIVE YEAR CLUB

(Continued from page 38A)

name has not, and the policy of furnishing the keys has continued uninterrupted.

The illustration shows the gold honor key, which is the emblem of the club. As originally designed by R. M. Hammes, the inscription read I.I.A.A. In 1944 the name was changed from the Iowa Industrial Arts Association to the Iowa Industrial Education Association. F. B. Hathaway of Mason City relettered the die, otherwise there were no basic design changes. The Heston-Anderson Company, Fairfield, Iowa, manufacturers of woodworking machinery, presents the keys to the men at the time of the initiation ceremony. The Iowa Industrial Education Association is deeply grateful for this sponsorship. The association has kept close contact with the company, generally through A. P. Twogood, Ames, or Iliff Leu, Fairfield. Questions regarding key memberships are generally directed to these two men.

By 1946, ten years after its inception, the club had grown to include the following members: Leonard Weston, Clinton; H. A. Brunsell, Burlington; E. G. Chambers, Dubuque; R. L. Hargitt, Burlington; M. M. Gerhart, Des Moines; H. R. Jacobi, Sioux City; Fred Frehse, Waterloo; E. S. Baird, Ames; C. H. Carter, Council Bluffs; T. A. Hippaka, Ames; M. A. Mosher, Davenport; A. P. Twogood, Ames; W. B. Galloway, Dubuque; C. J. Schollenberger, Des Moines; R. L. Brewster, Des Moines; Wm. D. Mayo, Des Moines; R. L. Bergstrom, Davenport; J. H. Gooch, Des Moines; Albert Jensen, Council Bluffs; C. E. McCaslin, Fort Madison; W. J. Knupp, Sioux City; Glenn Osborn, Ottumwa; John L. Morton, Des Moines; O. J. Haney, Independence; Harold G. Palmer, Cedar Falls; Robert McKig, Davenport; Jacob Roth, Cedar Rapids; R. M. Hammes, Council Bluffs; Hugh Logan, Waterloo; R. R. Ebersold, Cedar Falls; L. H. Wood, Sioux City; H. W. Carmichael, Des Moines; A. H. Horsburgh, Des Moines; James Seddon, Des Moines; L. E. Wass, Davenport; A. G. Hostetter, Des Moines; W. Foster Bickel, Washington; P. G. Frasier, Des Moines; C. L. Hutchinson, Chariton; John Paltridge, Des Moines; Otto E. Anderson, Des Moines; W. L. Ogden, Des Moines; A. C. Traudt, Sioux City; W. M. Hammond, Des Moines; Walter McMahon, Clinton; V. W. Hahn, Ottumwa; Wm. K. Ketchen, Emmetsburg; A. F. Wiegmann, Davenport; Chas. G. Turrall, Des Moines; I. F. Mueller, Council Bluffs; W. S. Morganthaler, Des Moines; B. E. Phillips, Maquoketa; Allen Sherman, Des Moines; C. G. Sykes, Newton; Russell Starr, Waterloo; Eric Jordan, Springville; C. L. Page, Ottumwa; Paul Megchelsen, Keokuk.

Beginning with the 1947 Fellowship Dinner the list continues: Roy Bartholemew, Iowa City; Earl Kimball, Waterloo; A. L. Hagen, Cedar Rapids; Harold Warrington, Des Moines; Lisle Ebaugh, Sioux City; Alfred Mahaney, Sioux City; Frank Judish, Fort Dodge; Warren Dickinson, Marshalltown; Harold Stout, Council Bluffs; Harry Shreves, Des Moines; Willis Haugen, Waterloo; W. W. Fisher, Sioux City; Clifford Petersen, Sioux City; Charles McCoy, Davenport.

The 1950 program, held at the Grand Ballroom of the Savery Hotel, Des Moines, Iowa, was typical of those generally followed at this dinner.

Harold Palmer, Mason City, and Lawrence Swartz, Marshalltown, became eligible to membership at midyear, in spring, 1951.

The Tennessee Valley Authority uses about 26,000 miles of A.C.S.R. — aluminum cable, steel reinforced — to carry electrical current being generated in its power plants.

Petroleum and petroleum products accounted for about four-fifths of all tonnage transported over the New York state barge canal system in 1950. — *Petroleum Newsnotes.*

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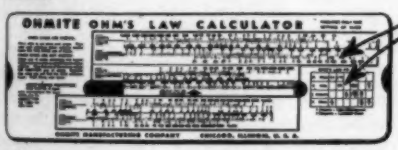
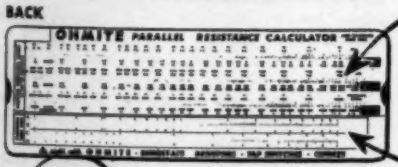


OHM'S LAW SCALES

BACK



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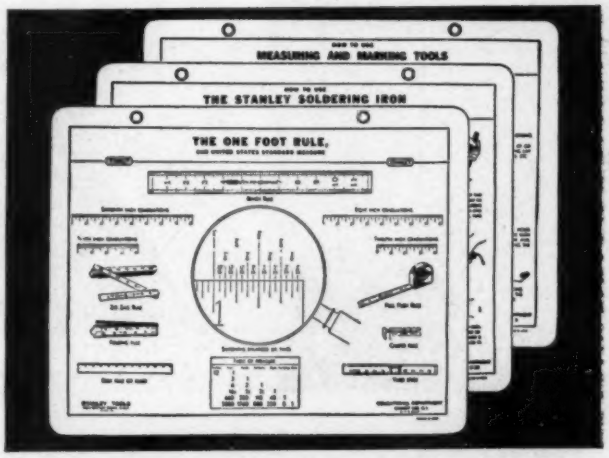
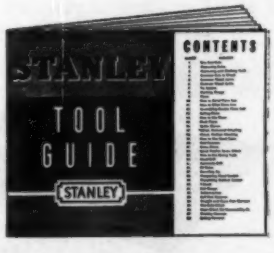


If you have used Stanley Instruction Charts in your classes, you know they're a big help in teaching proper tool care and use. And now for the first time in almost ten years these charts are available again in a *new* large size. They have been fully revised, with six new ones added. 38 charts in all — they give all the important tool facts for common woodworking and several metal-working tools. And the extra large size, 27½" x 20½", makes it easy for a large group to read them. Sold at cost, $5.50 a set, delivered anywhere in the U. S. In Canada, $8.50 postpaid.

STANLEY TOOL GUIDE
(Revised Edition)

For your students, Stanley offers the Revised Edition of the Tool Guide. Pages carry the same material as the large charts described above—38 in all—and are perforated and punched for 3-ring notebooks. Single copies are $.25 in the U. S. Ten or more, $.15 each. In Canada, 25c each. Prices cover postage.



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News Notes

APPRENTICESHIP — OUR BEST SOURCE OF FUTURE SUPERVISORY PERSONNEL

The value of apprenticeship as a background for supervisory work for men who have had its advantages is revealed in this comprehensive article by W. C. Van Cleaf, director of industrial relations, Allis-Chalmers Mfg. Co., Milwaukee, Wis. The vast majority of supervisory personnel employed by this company have been selected, he points out, from the ranks of journeymen who received their initial training through apprenticeship.

This article has been reprinted from *Supervision*.

Copies of this reprint can be obtained free of charge by communicating with the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.

♦ The address of Association Films' Chicago branch has been changed to 79 East Adams St., Chicago 3, Ill.

It was formerly 206 South Michigan Ave., Chicago 3, Ill.

Association Films occupies the *same* quarters as before. This is merely a change in mailing and delivery address.

♦ The S. S. United States, transatlantic superliner, built for the United States Lines, at the Newport News, Va., Shipbuilding and Dry Dock Company yards, utilizes more than 2000 tons of aluminum for most exterior installations where strength and high corrosion resistance are required. This makes this vessel the largest aluminum structure of any type ever built.

The result of the weight reduction thus achieved will mean materially higher speeds, with economy of power and fuel, good seagoing qualities and relatively greater passenger-carrying capacity.

♦ The American Vocational Association, Inc., Denrike Bldg., 1010 Vermont Ave., Washington 5, D. C., have published a brochure entitled "Salary Incentives for Teachers of Industrial and Distributive Education."

This booklet clarifies some of the factors affecting the salaries of teachers in these two important fields. It takes the basic position that, in order to obtain high caliber teachers and thus to maintain a high level of instruction in the industrial and distributive education programs, it is necessary to offer an initial salary which compares favorably with that offered by commercial establishments demanding the same skills and knowledge.

The price of the booklet is 15 cents per copy.

♦ A joint program of study leading to degrees in both liberal arts and engineering has been set up by Illinois College at Jacksonville, Ill., and Illinois Institute of Technology, Chicago 16, Ill.

Students will attend Illinois college three years and Illinois Tech two years. They will then receive a bachelor of art's degree from Illinois college, and a bachelor of science in a designated field of engineering from Illinois Tech.

The purpose of the plan is to help meet the country's need for trained engineers with a background of general knowledge.

♦ Beginning in September, 1951, Stevens Institute of Technology, Castle Point, Hoboken, N. J., will admit men to courses leading to the degree of doctor of science.

At present the Institute gives only the degree of master of science for regular academic work in the graduate school, but a program leading to the degree of doctor of philosophy was offered for a short period of time in the early history of the Institute.

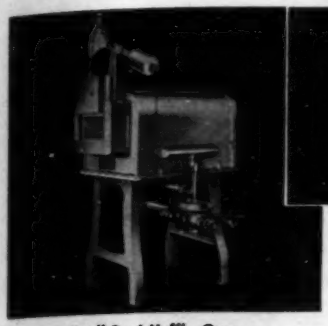
The trustees authorized the faculty to formulate requirements and programs for the doctorate in June, 1949. In February of this year the faculty voted approval of the requirements for the doctor's degree on the basis of recommendations submitted by the Graduate School after more than two years of study on the subject.

The Graduate School will accept a limited number of carefully selected students for this program which will help meet a national need for men qualified to work at the highest scientific and engineering levels.

Prof. Richard F. Deimel has been made chairman of the department offering this degree, specialization in dynamics, elasticity and hydro- and aerodynamics. The division will incorporate activities from several departments, including mechanical engineering, fluid dynamics, mathematics and physical science, and the experimental towing tank.

A student may work for his doctorate on a

(Continued on page 45A)



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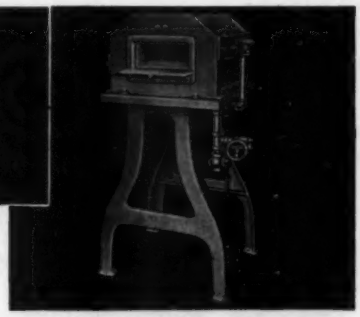

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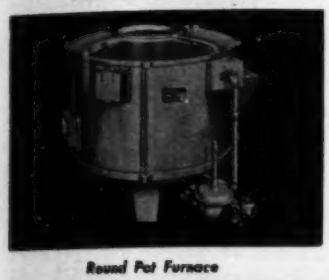
HUNDREDS OF THESE SUNBEAM STEWART FURNACES ARE IN THE VOCATIONAL DEPARTMENTS OF TECHNICAL SCHOOLS



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NEWS NOTES

(Continued from page 42A)

full-time or part-time program, depending on his outside employment, but he should plan to spend one academic year in resident research. Three academic years, or the equivalent, are required to earn the degree. Among the requirements are a reading knowledge of technical German.

♦ The California State Department of Education has prepared a set of instructional materials for training apprentice tool- and diemakers.

The workbook which has been prepared contains six major units covering over fifty technical topics, and a testbook containing an objective test for each of these topics.

Subjects covered are tools, jigs, and fixtures, gauges; punch press dies; forging dies; die-casting dies; and plastics dies. Each of these sections was prepared by an expert craftsman in his special field.

Anyone interested in obtaining copies of the new tool and diemaking course may do so by writing to: California State Department of Education, Bureau of Textbooks and Publications, Library-Courts Building, Sacramento 14, Calif.

The price of the Tool and Diemaking Workbook is $2, the Tool and Diemaking Testbook is $2, and the Final Examination is 15 cents.

♦ A new report, prepared as a public service by The National Information Committee on Lighting, summarizing the vital present-day services of illumination in American industrial production, in public safety, in research and education, and in government, has recently been published, it was announced today by Edmond C. Powers, the Committee's executive secretary.

The 24-page report titled, "Lighting and the Nation's Welfare," is broken down into five sections: production lighting, office lighting, protective lighting, public safety lighting, and education lighting.

Production increases by as much as 30 per cent have been achieved by proper light. Illumination also reduces eye strain and fatigue as shown by a decrease of 30 per cent in one plant for headache tablets following installation of proper lighting. The importance of proper light in quality control is evident in typical reports showing a decrease in production errors up to 50 per cent. Lighting also assures the safety of production workers both as regards machine operation and movements from one location to another.

In addition to complete statistics on the effects of lighting, this 24-page report contains several comprehensive charts and graphs, illustrating many of the important points brought out by the study.

The report is available at 15 cents per copy in quantities of 100, and 10 cents per copy in lots of 500 or more. Single copies are available at 25 cents each. Requests should be addressed: *National Information Committee on Lighting, 1410 Terminal Tower, Cleveland, Ohio.*

♦ A dramatic series of 16mm. sound motion pictures will help guide young people facing the difficult civilian-to-military adjustments. The films, produced and released exclusively by Coronet Films, 65 E. South Water, Chicago 1, Ill., are formally designed to orient high school students in their planning for military service, *well in advance of induction or enlistment.*

The series of premilitary orientation films, titled *Are You Ready For Service?*, consists of four groups of subjects totaling 14 films in all.

The initial group of three subjects will be available in the latter part of September. It serves as an introduction to the series, and orients the audience to world, national, and personal viewpoints. It consists of these three films: *What It's All About, Your Plans,* and *Service and Citizenship.*

The second group, scheduled for release in the latter part of November, 1951, deals with specific adjustments of the individual. Titles in this section are: *Starting Now! Getting Ready Physically, Getting Ready Emotionally,* and *Getting Ready Morally.*

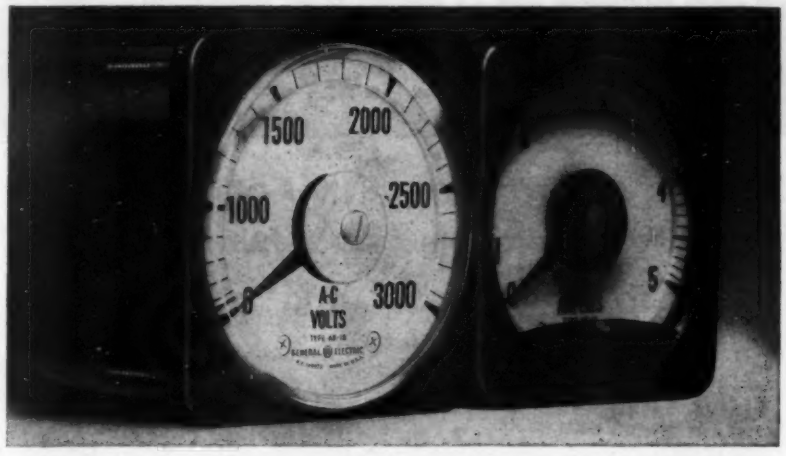
The third group deals primarily with the military services and also consists of four titles. Nationwide distribution will begin in early January, 1952. This group will include *The Nation To Defend, What Are The Military Services?, When You Enter Service,* and *Military Life and You.*

The final release group will be available in February, 1952, and will include the important subjects of *Communism, Why You?* and *Your Investment In the Future.*

A descriptive booklet on the "Are You Ready for Service?" series is also available and may be had without cost for the asking.

♦ Industrial Arts Awards sponsored by Ford, made 467 awards to boys and girls last year. The 1951 Fair will be held at the Chicago Museum of Science and Industry on August 17 to October 14.

♦ Science Research Associates, 57 West Grand Ave., Chicago 10, Ill., have just issued the May, 1951, Guidance Index. This publication is especially designed for counselors, teachers, and administrators.



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New Publications

Machine Shop Mathematics

By Aaron Axelrod. Cloth, 359 pp., 6¼ by 9¼ in., illus., $3.60. McGraw-Hill Book Co., Inc., New York, N. Y.

This is the second edition of this text. The material has been thoroughly revised and enlarged with a number of new units.

The contents present much refresher material together with technical information on measuring tools.

Shop geometry with its problems of areas, volumes, and weights is well represented, and there are numerous new problems on percentage and proportion.

Shop trigonometry, pulleys and gears, speeds and feeds, and gears will give the student opportunity to apply his knowledge of mathematics to the problems arising in the machine shop.

Plywood Projects for the Home Craftsman

By Robert Scharff. Cloth, 180 pp., 6⅞ by 10 in., illus., $3.95. McGraw-Hill Book Co., Inc., New York, N. Y.

A helpful book for the home craftsman, the homeowner, and for the industrial-arts instructor who uses plywood in his school shop.

The book contains many working drawings and half tones which show how plywood can be used for numerous purposes. There are also a number of illustrations which show how various projects may be constructed.

In these days of home renovation, this book should be very welcome.

Etching, Spinning, Raising, Tooling Metal

By Robert E. Smith. Paper cover, 83 pp., 7¾ by 10¾ in., illus. McKnight & McKnight Publishing Co., Bloomington, Ill.

A book chock-full of items of information and descriptions of methods of doing the items embodied in the title of this book. While many of these operations of forming metals may be traced back to almost prehistoric times, they are still being used at the present time.

The book gives clear directions for performing the various operations, and it is well for the student of metalworking to know something about them.

Popular Mechanics Motorist's Fix-It Book

Cloth, 144 pp., 6⅝ by 9⅝ in., illus. Popular Mechanics Press, Chicago 11, Ill.

A book which will be welcomed by many who wish to cut down the cost of keeping their car in good condition.

Armed with information found in this book, the owner can learn how to tune up his motor, take care of the clutch, diagnose troubles by listening to the car noises, learn to shoot starter troubles, detect cause of chassis chatter, service wheel bearings, take care of his tires, rebuild fenders, service the brakes, get the most out of his gasoline, service the cooling system, lubricate the engine, prepare the car for storing, and many other worth-while and money-saving kinks.

Modern Chemistry

By Charles E. Dull, William O. Brooks, and H. Clark Metcalfe. Cloth, 564 pp., 6⅛ by 9⅛ in., illus. Henry Holt & Co., New York, N. Y.

The material in this book, designed for high school students, is so arranged that weaker students can be assigned subject matter that will enable them to get a connected understanding of chemistry in logical order, while sections suitable for superior students are starred so that they can get more advanced work which may be of assistance to them when they take college chemistry.

The book is profusely illustrated, each chapter presents a number of questions and problems gauged to the ability of the student, and also lists things that the student should do.

Printing Primer

By Hartley E. Jackson. Paper, 52 pp., 6¼ by 10⅜ in., illus., $1. Stanford University Press, Stanford, Calif.

A manual for the beginning student in printing. The descriptive material is arranged in step-by-step fashion so that the student can proceed with most jobs with comparatively little supervision.

There are 21 job assignments, each of which presents the reason for doing that particular job, a statement as to what is required for performing the operation, detailed direction as to what must be done, some special cautions with regard to the use of certain needed equipment, related information, and a number of questions for the student to answer.

(Continued on page 48A)

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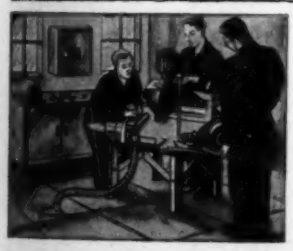

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By J. H. Farmer, A. J. Hoecker, and F. F. Vavrin. A basic text on production illustrating, giving step-by-step, fully illustrated directions for making true-scale perspective drawings, exploded views, and freehand drawings based on mechanical construction principles; and for preparing drawings for reproduction. $5.00

Aircraft Engine Maintenance and Service

By R. H. Drake. This volume completes the Aircraft Mechanic series of texts for all subjects required for the CAA A & E certificate and specialist ratings. The other books in the series cover woodwork, sheet metal, welding, engines, electrical and hydraulic systems and instruments, and aircraft maintenance and service. $5.00

The Macmillan Company, 60 Fifth Ave., New York 11

NEW PUBLICATIONS

(Continued from page 46A)

Fastening Methods for Aluminum

Compiled by F. F. Dietsch and G. W. Birdsall. Stiff paper, loose leaf, 136 pp., 5⅞ by 8¾ in., illus. The Reynolds Metals Co., 2500 South Third St., Louisville 1, Ky.

This book contains information on the many different ways for mechanically joining aluminum parts, including the use of metal stitching, resin bonding and ingenious mechanically formed joints. Other joints are made with rivets, screw fasteners, nails, or pins . . . all are described in detail, their applications analyzed, and advantages pointed out.

Unlike welding, brazing, and soldering, which are limited to the production of metal-to-metal joints, mechanical fastening methods are suitable not only for joining aluminum to aluminum, but aluminum to wood, plastics, fabrics, and other nonmetallics. However, there has been little published information available on these important fabrication processes and it is to answer this need that this book has been written.

Preparation and Use of Audio-Visual Aids

By Kenneth B. Haas and Harry Q. Packer. Cloth, 327 pp., 6⅞ by 9¼ in., illus., $3.50. Prentice-Hall, Inc., New York, N. Y.

A text which explains clearly how to make and use motion pictures, the film strip and sound slide film, teaching slides, projectors, maps, charts, graphs, diagrams, flash cards, posters, manuals, blackboard and bulletin board, specimens, models, etc.

It also describes the value of field trips, the use of radio equipment, television, and how to evaluate and use audio-visual aids.

The sources of audio-visual aids also are listed.

Principles of Electrical Engineering

By William H. Timbie and Vannevar Bush. Cloth, 626 pp., 5⅞ by 8⅝ in., illus., $6.50. John Wiley & Sons, Inc., New York, N. Y.

The authors of this book are thoroughly experienced in teaching college electricity and the fourth edition of this book gives ample evidence of this thoroughness.

The present book stresses advanced methods for analyzing electric and magnetic problems, methods of circuit analysis, and the relation of the fundamental problems of the electric and magnetic fields to circuit analyses.

Automotive Service and Trouble-Shooting

By William H. Crouse. Paper cover, 138 pp., 8¼ by 11 in., $1.20. McGraw-Hill Book Co., Inc., New York City.

This workbook is correlated with the second edition of *Automotive Mechanics and Automotive Equipment* by the same author.

Trouble-shooting procedures for the engine, electrical and fuel system, steering, transmission, brakes, and other component parts of the automobile are outlined in detail.

Careers for Young Americans in the Army and After

By Reuben Horchow. Cloth, 226 pp., 6¼ by 9¼ in., illus., $3.25. Public Affairs Press, Washington 8, D. C.

This book presents an analysis of what the army has to offer young men and women. It also lists the opportunities offered to those who enlist in the army which can be made fruitful in civilian life after service in the army is over.

The book also shows what army pay really amounts to, what promotions may be expected, and describes the army's new vocational system.

The Film Book for Business, Education, and Industry

By William H. Wilson and Kenneth B. Haas. Cloth, 259 pp., 6¼ by 9¼ in., illus., $3.50. Prentice-Hall, Inc., New York 11, N. Y.

The value of visual aids is quite well understood in business, education, and industry, and this book re-emphasizes what is already known and presents an analysis which demonstrates how the best use can be made of films in training the learner, the worker, and the public.

The A-B-C's of Aluminum

Glossy coated paper cover, spiral binding, 96 pp., 6 by 8¾ in., illus. Reynolds Metals Co., 2500 S. Third St., Louisville, Ky.

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(Continued on page 50A)

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(2) ORGANIZING & TEACHING THE GENERAL SHOP ..... *Newkirk*, $4.00

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6. **MATHEMATICS FOR SHEET METAL WORKERS: Chamberlain.**
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NEW PUBLICATIONS

(Continued from page 48A)

Designing With Aluminum Extrusions

Compiled by H. V. Menking. Paper, loose leaf, 138 pp., 5⅞ by 8¾ in., illus. Technical Service Department, Reynolds Metals Co., Louisville, Ky.

Basic engineering principles for most effective use of extruded aluminum shapes are explained and illustrated in the 1950 edition of this book. A copy of the book will be sent without charge to instructors of metalwork only when requested on school letterheads. The new book breaks down the advantages of the extrusion process into eight principles of design. Then each of these is illustrated and explained in detail by use of diagrams, charts, and pictures of actual parts.

The section on examples of effective extrusion design contains more than 140 illustrations showing details of specific applications.

Everyday Arithmetic — Junior Book 2

By Harl R. Douglass, Lucien B. Kinney, and Donald W. Lentz. Cloth, 502 pp., 5¾ by 8¼ in., illus. Henry Holt & Co., New York, N. Y.

A text which presents many applications of arithmetic to real life problems.

These problems are presented as mathematics for the worker and earner, the consumer, for design and construction and for buying and selling.

Problems which can be solved by means of formulas, the solution of triangles, problems in banking and investments, and the use of elementary algebra also are included in the text.

The text is generously provided with illustrations, examples, diagnostic tests and extra workouts, and it also contains a useful glossary.

Automotive Tools

By William H. Crouse. Paper, 112 pp., 8¼ by 11 in., illus., $1.20. McGraw-Hill Book Co., Inc., New York, N. Y.

This text contains 28 job sheets, each of which is confined to the use of one tool.

The book contains many fine illustrations, and these, together with the suggested references, safety suggestions, procedure directions, and objective test questions, and the reviews make a helpful workbook for the auto mechanics shop.

Home Economics in Higher Education

By the Committee on Criteria for Evaluating College Programs in Home Economics. Gladys Branegan, chairman.

Cloth, 181 pp., 5⅞ by 8¾ in. American Home Economics Association, Washington, D. C.

A book which formulated standards of excellence which can be used to serve as criteria in appraising home-economics departments in institutions of higher learning.

Television and FM Antenna Guide

By Edward M. Noll and Matthew Mandl. Cloth, 311 pp., 6¼ by 9½ in., illus., $5.50. The Macmillan Co., New York City.

A text which presents a good picture of how an antenna is to be erected and gives the reasons of why it must be so erected.

To give the technician background material for his job the first part of the book is devoted to an antenna course in which the theory of wave propagation, transmission lines, antenna principles, and antenna systems and arrangements are clearly presented and explained.

Part 2 of the book is the reference guide in which the types, method of guying and erection, transmission installations, input systems, booster amplifiers, directors and reflectors, interference reduction, etc., is expounded.

Finishes for Aluminum

By H. V. Menking. Paper, loose leaf, 124 pp., 5⅞ by 8¾ in., illus. Reynolds Metals Co., Louisville, Ky.

The 1950 edition of the process manual, "Finishes for Aluminum," is a revision of the book first published in 1947. The 1950 edition not only supplies basic information on the various processes for applying surface finishes to aluminum, but also details the characteristics of the finishes so produced.

It includes information on 10 cleaning treatments, 15 mechanical finishes, 16 chemically produced finishes, 11 electrolytic oxide finishes, organic finishes, and specialized finishes such as luminous paints and vitreous enamels.

Available only to instructors of metalwork when requested on school stationery.

Plastics for the Home Craftsman

By Harry Walton. Cloth, 191 pp., 6⅛ by 9¼ in., illus., $4. McGraw-Hill Book Co., Inc., New York, N. Y.

The plastics are so attractive that most people will find it easy to make a hobby of working with them.

This book will be helpful to the beginner as well as to those who do advanced work. It tells in interesting language how to make some of the needed equipment and then gives directions in clear, easy to follow language just how to do the layout and other work needed to make the many interesting projects described and illustrated in the book.

There are 14 chapters in all. The titles of these chapters follow: I. A Honey of a Hobby; II. Transferring Ideas to Material; III. Let's Cut It Out; IV. You're Ready to Make Things; V. Hole Making and Edge Smoothing; VI. Working Up a Polish; VII. Giving Plastic Its Shape; VIII. Pitching Fast Curves in Acrylic; IX. Putting the Pieces Together; X. Department of Neat Tricks; XI. Craftsmanship in Light and Color; XII. Beauty From the Inside Out; XIII. How to Learn Internal Carving; XIV. Casting Liquid Plastic. The book also contains sources of supply and an index.

♦ The Chrysler Corporation has just made available for free group showings a 22-minute sound motion picture entitled "The Case of Tommy Tucker."

Produced by Wilding Picture Productions, this picture has been designed to help in the safety programs of schools, colleges, youth organizations and other interested groups.

"The Case of Tommy Tucker" has a dramatic story treatment, professionally acted and produced. To arrange a free showing of this picture, contact your local Plymouth dealer or the nearest representative of Modern Talking Picture Service, Inc.

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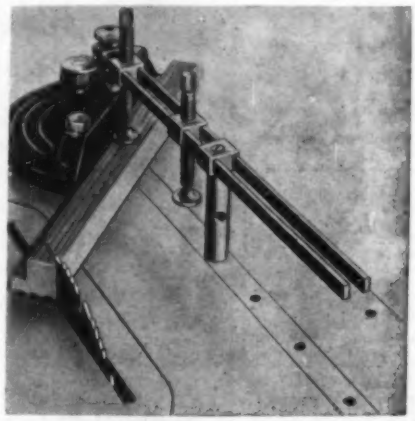
SHOP EQUIPMENT NEWS

MITER GAUGE CLAMP ATTACHMENT

The Power Tool Division, Rockwell Mfg. Co., Milwaukee, Wis., announces the introduction of a clamp attachment No. 865 for the standard Delta miter gauge. This device is especially valuable when making accurate miter cuts and



Miter gauge clamp attachment

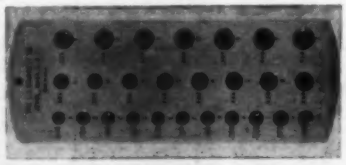
when cutting irregular stock. It can be attached to any standard Delta miter gauge, and it can be used on 8 and 10-in. Delta circular saws, band saws, spindle shaper, and abrasive finishing machines. The No. 865 clamp attachment is sold through the Delta dealer organization.

For further information address the *Power Tool Division, Rockwell Mfg. Co., Milwaukee 1, Wis.*

For brief reference use IAVE—0701.

STANDARD LETTER SIZE DRILL GAUGE AND WIGGLER CENTER FINDER

Letter size drills can be quickly and conveniently checked with the No. 198 drill gauge made by The L. S. Starrett Company. Twenty-six gauging holes are provided giving corresponding drill sizes from *A* through *Z* with decimal equivalents from .234 inch diameter through .413 inch diameter.

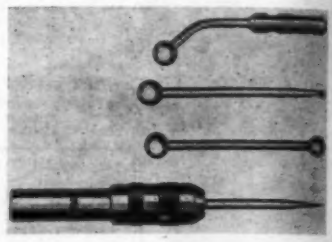


Starrett standard letter size drill gauge No. 198

The gauge is approximately 5/64 in. thick by 2 5/16 in. wide and 6 1/4 in. long. Hardened and ground, bright finish, thoroughly tested after hardening.

The firm has also developed a wiggler or center finder. This new tool is provided with additional points and attachments which make it widely adaptable to precision work. The attachments are clamped in a shank by a ball swivel joint which permits adjustment to true concentricity or to any angular position.

With this wiggler and its attachment, work for vertical or milling machines can be quickly and accurately aligned so that the work can be brought into perfect alignment with the machine spindle. Spring tension can be varied by an adjusting screw on the back of the shank.



Starrett wiggler (center finder) No. 832

The ball contact is useful in locating work by first bringing the contact (ball diameter .250 in.) against the work, slot, hole, shoulder, or end and then indexing the work to the desired position relative to the spindle.

Another contact has a small disk at the end .100 in. diameter, which permits use in more confined areas such as slots, shallow holes, etc.

Using the offset indicator holder in conjunction with Starrett Last Word Test Indicators, the mechanic can sweep holes or O.D.'s for checking runout or concentricity; establish center distances; check straightness or alignment of flat surfaces; plus other jobs in machining, layout, checking, or inspection operations.

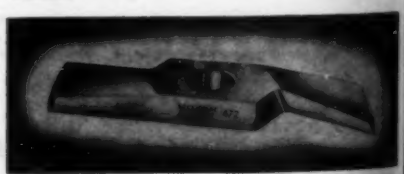
Shank diameter is ⅜ in.; length of shank only 2⅜ in.; length with attachments approximately 4⅛ in.

For further information write to *The L. S. Starrett Co., Athol, Mass.*

For brief reference use IAVE—0701.

BOICE-CRANE TRU-FORM PANEL CUTTER

A new raised panel cutter embodying all of the advantages of this firm's Tru-Form Relief Safety Cutters, has been perfected by Crane Company, Toledo.



Tru-Form panel cutter

Boice-Crane's Tru-Form manufacturing process permits this production-type cutter to be offered in high speed steel at a price only slightly higher than ordinarily charged for forged, carbon steel panel raisers.

(Continued on page 54A)

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SHOP EQUIPMENT NEWS

(Continued from page 52A)

By the Tru-Form principle, the shape is machined into the cutter on an arc that assures clean cutting and the elimination of burning ordinarily due to lack of clearance. Cutting qualities are so improved by this design as to result in smoother work, lessened power requirement, longer service without resharpening and consequent longer cutter life. The shaving like cut furthermore reduces machine wear and tear.

The cutter shape is permanently milled in by the Tru-Form principle so that the same true original shape and dimensions are cut right up to the last sharpening. The last panel cut will exactly match the first, regardless of the number of cutter regrinds.

This new raised panel cutter, like all Tru-Form cutters, is shipped with a plastic coating, which assures perfect protection of the cutting edge, and is packed in a check-chart carton that embodies illustrated resharpening instructions and templates for checking all engineered angles.

A new brochure on Tru-Form cutters, as well as of this firm's new 48-page catalog on power tools, will be sent to anyone addressing *Boice-Crane Co., 974 Central Ave., Toledo 6, Ohio.*

For brief reference use IAVE—0703.

NEW PACKAGING FOR NEEDLE FILES

The E. C. Atkins Company is offering 12 genuine Swiss Needle Files in a handy transparent plastic case, approximately 6¾ by 2⅜ by ¾ in. over all. These individual holders prevent the files from rubbing together, and protect their points.

E. C. Atkins Swiss needle files

The files in No. 2 or medium cut have knurled handles for positive grip, and come in the following shapes: round, square, three-square, warding, knife, half-round, marking, crossing, barrette, equaling, slitting, and round-edge joint.

This set is ideal for hobbyists, model builders, home craftsmen, tool and die makers, and jewelers where precision work is required.

For further information write to *E. C. Atkins and Co., 402 So. Illinois St., Indianapolis 9, Ind.*

For brief reference use IAVE—0704.

PORTER-CABLE'S NEW SANDER

Porter-Cable Machine Company's new floor machine was developed from their prewar sander, the F-87. Model 504 combines the proved, [illegible] standing features of the old F-87 with all the up-to-the-minute improvements.

It is equipped with a heavy-duty 2-h.p. [illegible] to provide plenty of power yet preserve the over-all balance of the machine.

The interchangeable drum cover, standard equipment on the new sander, can be renewed in just three minutes.

Porter-Cable's Model 504 sander

The new "Contractor Special" is equipped with a large, powerful fan which picks up 97 per cent of the dust. A convenient clean-out hole at the bottom of the machine traps pieces of sandpaper, nails, and other foreign objects before they reach the fan.

A special drum pressure control enables the operator to select any one of five stages of cutting pressure. This pressure control equalizes the wear of the abrasive paper which results in approximately 30 per cent more work per sheet. It also minimizes the danger of making dips and hollows due to varying pressure.

Although the machine weighs 241 lb., it responds instantly to the hand and will turn in a tight 3-ft. circle. The 8-in. drum cuts within 1 in. of the quarter round which means less trimming with an edger is required. A rubber bumper protects the baseboard from scratches.

Specifications: motor 2 h.p., 115/230 volt, [illegible] cycle, single phase; drum 8 in. wide, 7⅛ in. diameter; drum speed 1600 r.p.m. and 2000 r.p.m.; surface speed 3140 s.f.p.m. and 3925 s.f.p.m.; fan diameter 6¾ in.; fan speed 5200 r.p.m.; over-all dimensions — width, 13¾ in., length, 36 in., height, 36 in., height to top of motor, 20 in.; weight, chassis only, 121 lb.; weight, motor only, 120 lb.; shipping weight, 329 lb.

Standard equipment — 100 ft. cord assembly, carrying handle assembly, paper cutting template, abrasive paper in 6 grits; dust bag; grease wrenches.

For further information, write to *The Porter-Cable Machine Co., Syracuse, N. Y.*

For brief reference use IAVE—0705.

A NEW CINCINNATI TOOL AND DIE MILLER

A new brochure describing the 8 by 18-in. tool and die miller made by the Cincinnati Milling Machine Company, has just been issued. It is yours

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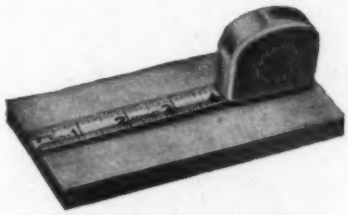
illustrated throughout, and describes the details of construction and operation, attachments that can be obtained, and applications that can be made to the new machine.

For further information, and for a copy of this interesting booklet, write to *The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.*

For brief reference use IAVE—0706.

THE NEW STANLEY PULL-PUSH RULES

Stanley Tools announced new "Pull-Push" Rules No. 556 (6 ft.) and No. 558 (8 ft.) featuring a blade ⅝ of an inch wide for greater rigidity.



Stanley Pull-Push rule

Nickel-plated blade has a special rust-resistant finish built up around graduations and numerals for maximum wear. The blade may be safely and positively replaced in a few seconds "outside" the case. Modern streamlined "D" shaped nickel-plated case with brushed satin finish, is handy for inside measuring — read measurement at case opening, add two inches (width of case) for exact inside dimensions. Large black numerals and graduations are easy to read. Similarly styled No. 556E Engineers Rule, is graduated in 10ths and 100ths of feet on lower edge only.

For further information address *Stanley Tools, New Britain, Conn.*

For brief reference use IAVE—0707.

FIFTY YEARS OF SERVICE

The Johnson Gas Appliance Co., Cedar Rapids, Iowa, has just issued its new catalog, No. 51, to commemorate its fifty years of service to schools and to industry.

Catalog No. 51 lists all the various furnaces — heat-treating, melting, hardening, soldering — together with the special burners and other gas appliances made by this firm.

If you have use for gas equipment of this kind, write to *Johnson Gas Appliance Co., Cedar Rapids, Iowa,* for a copy.

For brief reference use IAVE—0708.

NEW ADDITIONS TO THE PROTO AUTOMOTIVE TOOL LINE

Addition of three new PROTO special automotive tools and improvement of five tappet wrenches have been announced by the Plomb Tool Company, Los Angeles, Calif.

One of the new tools is a dual-purpose lock-ring plier, No. 250, which spreads both the soft iron "horseshoe" lock washers used on car brakes and the tempered steel lock or snap rings of the contracting type used on shafting to locate gears, bearings, sprockets, pulleys, and wheels. The plier is 7¾ in. long, has a 1¼-in. jaw spread, employs serrations on the jaws to prevent slippage, and

(Continued on next page)

QUICK SET DADO
6" dia. adjusts ¼" to 13/16" ½", 5/8" or ¾" hole
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•
9" dia. adjusts ¼" to 1 1/16" with ¾" and 1" hole
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for thick and thin knives up to 30" long
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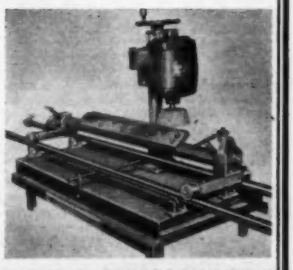

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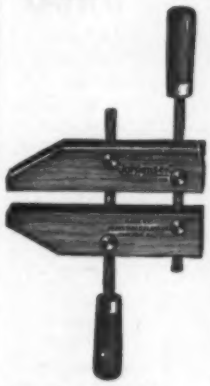

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Jaws are clear, straight grain hard maple, properly seasoned and manufactured in our own shop. Cold-drawn steel spindles. Hard maple handles that will not come loose. All parts carefully fitted for smooth, trouble-free operation.

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This new Hotpack Electric Furnace is fast heat-built for continuous use from 300° F. to 2000° F. It is the only Furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limistat control in this price field.

No. 7057

SPECIFICATIONS

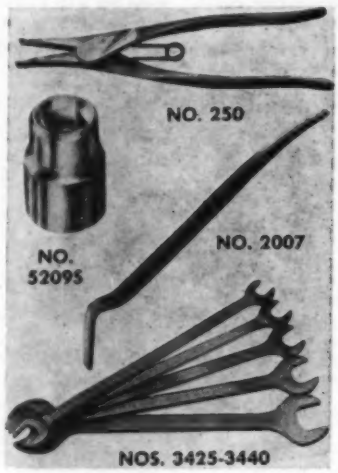
Model	Interior Size W. D. H.	Current Characteristics
7056	8"x 8"x 5½"	110 V-AC-15 Amp.
7054	8"x 8"x11"	115 V-AC-15 Amp.
7055	12"x12"x11"	220 V-AC-23 Amp.
7057	15"x15"x16½"	200 V-AC-30 Amp.

Model	Shipping Weight	Price F.O.B. Phila.
7056	180 lbs.	$160.00
7054	200 lbs.	$190.00
7055	350 lbs.	$305.00
7057	550 lbs.	$495.00

THE ELECTRIC Hotpack COMPANY, INC.
5067 Cottman Ave. Philadelphia 35, Pa.

SHOP EQUIPMENT NEWS

(Continued from previous page)



Proto lock-ring plier, "Dynadrain" socket, brake tool and tappet wrenches

has a strong spring to hold the jaws together for easy insertion.

Another new PROTO tool is the No. 5209S "Dynadrain" socket, a ⅜-in. drive socket wrench with 9/32-in. square opening for turning the ⅛-in. drain plug with 9/32-in. square head on Buick Dynaflow torque converters.

A third new tool is the No. 2007 Chevrolet brake adjuster, which has a 45-deg. spoon, 1 3/16 in. long, and a 15-deg. spoon, 1 7/16 in. long. This tool supplements the No. 2006 brake adjuster — suitable for most cars except Chevrolets.

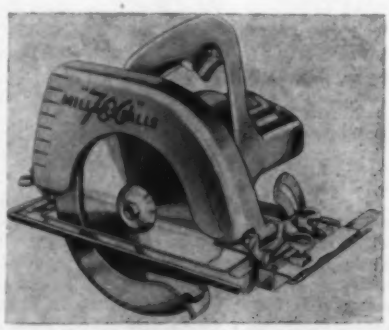
Several improvements were made in the five PROTO tappet wrenches, Nos. 3425–3440. Their shanks were narrowed, heads were made smaller and pear-shaped, head thicknesses were changed to fit more engines, and lengths were increased.

For further information on any of these items, address *Plomb Tool Co., Los Angeles, Calif.*

For brief reference use IAVE—0709.

MILLERS FALLS ANNOUNCES NEW 7-INCH PORTABLE ELECTRIC SAW

The Millers Falls Company have just developed their new No. 700, 7-in. portable electric saw.



Millers Falls new No. 700 7-in. portable electric saw

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Quick, simple adjustments for depth, 2⅜ to ¾ in., are provided, and an adjustable ripping gauge is mounted on the toe of the base.

For further information address *Millers Falls Tools Company, Greenfield, Mass.*

For brief reference use IAVE—0710.

NEW SOUTH BEND DRILL PRESS MANUAL

"How to Run a Drill Press" is the title of a new manual, for shopmen, recently announced by South Bend Lathe. As its name implies, this book has been prepared as a companion to the company's best seller "How to Run a Lathe."

Devoted exclusively to the small sensitive-type drill press, this book contains a wealth of practical information of value to the experienced machinist as well as to the beginner. The section covering care, operation, and maintenance includes illustrations giving the name and function of all important parts and correct adjustment of each unit. Detailed instructions and clear illustrations take the mystery out of grinding the drill point so it will cut properly.

Best methods for mounting and removing chucks and tools are explained and many paragraphs are devoted to best practices for laying out and setting up work. Although intended primarily for metalworking shops, the book includes many special classes of work including boring and sanding wood parts, drilling through glass, polishing and buffing, surface finishing, use of mortising attachment, vise, etc.

This 32-page book can be secured direct from the *South Bend Lathe Works, South Bend 22, Ind.* Price, 25 cents postpaid.

For brief reference use IAVE—0711.

SCHOOL SERVICE UNIT

Walker-Turner's Education Department is prepared to offer assistance in *School Shop Planning* to teachers, supervisors, and architects. We have a layout board with walls, doors, and windows and a rather comprehensive set of miniature models made to the scale of ½ in. to the foot.

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(Continued on next page)

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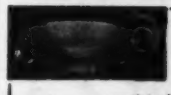

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SHOP EQUIPMENT NEWS

(Continued from previous page)

1. Size of schoolroom, length, width, height of ceiling.
2. Sketched location of windows, doors, and service outlets such as plumbing, etc.
3. Electric current available, voltage, cycle, phase.
4. Amount of funds available for equipment, round figures.
5. Grade level of students to be taught, Jr. H.S. — 7, 8, 9; Senior H.S. — 10, 11, 12.
6. Type of shop — unit, general unit, or comprehensive general shop.
7. Type of school — academic, technical, or vocational.
8. A name and telephone number to call for further information.

To avail yourself of this service address your problem to *Walker-Turner Division, Kearney and Trecker Corp., Plainfield, N. J.*

For brief reference use IAVE—0712.

CHAS. A. BENNETT CO., FILM STRIPS

Four new film strips of interest to those engaged in craftwork have recently been published by the Chas. A. Bennett Company. These new releases are based on successful books.

"You Can Make Jewelry" (in two parts) is based on the book, *Cabochon Jewelry Making, Part I* by Arthur and Lucille Sanger. Captioned pictures show stones selected for mounting in the form of pendants, necklaces, and bracelets. Only American semiprecious stones available to everyone and requiring the simplest materials and tools are used. Part II continues with the ring, pin and brooch.

"American Braiding Craft" film strip is based on the popular book, *Palmetto Braiding and Weaving* by Cooke and Sampley. It shows in detailed closeups the many various braids and weaves that can be fashioned with palmetto, rush, and other American materials.

The fourth new film strip, "Native Crafts," is based on the craft book, *Use of Native Craft Materials* by Margaret Shanklin. This strip shows how rush, grass, straw, cornhusks, etc., may be used in the making of hats, mats, bags, etc.

For further information write to the *Chas. A. Bennett Co., Peoria, Ill.*

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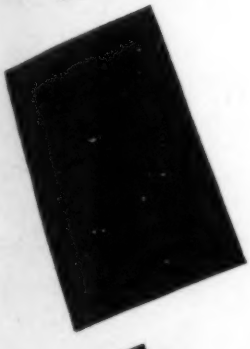

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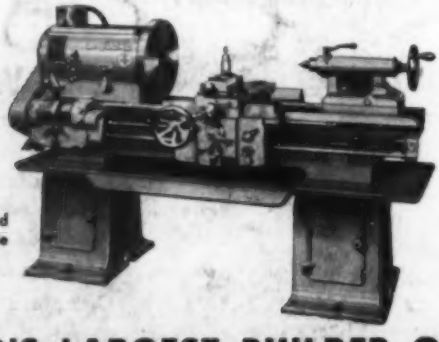

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